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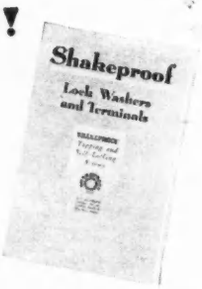

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Volume 69 Number 8

Reg. U. S. Pat. Off.

JULIAN CHASE, Directing Editor

DON BLANCHARD, Editor

P. M. HELDT, Engineering Editor JEROME H. FARRIS, Ass't Editor
JOSEPH GESCHELIN, Eng. Editor ATHEL F. DENHAM, Field Editor
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Contents

The Industry's Labor Record During the Depression. By Don Blanchard 201

Just Among Ourselves 203

New Profilograph Measures Roughness of Finely Finished and Ground Surfaces. By E. J. Abbott and F. A. Firestone 204

Bureau of Standards Report on Alcohol's Solubility in Gasoline 207

Decreased Production and Scientific Management Make Profit Possibilities. By Joseph Geschelin 208

Unit Generator Motor in New Transmission ... 212

Shore Plant to Make Bromine from Salt Water 214

Engine Method Favored for Testing Diesel Fuels 217

New Developments 221

News of the Industry 222

Business in Brief 223

Automotive Oddities 227

Calendar of Coming Events 228

Advertisers' Index 36

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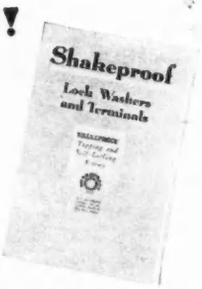

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AUTOMOTIVE INDUSTRIES

Vol. 69, No. 8 • THIRTY-FIFTH YEAR • August 19, 1933

The Industry's Labor Record During the Depression

Official indexes show that labor's share of the automotive sales dollar was 13 per cent larger in 1932 than in 1929

by Don Blanchard
Editor, Automotive Industries

OFFICIAL indexes of automotive employment and payrolls tell a story to which the industry can point with some measure of satisfaction. These indexes show clearly that automotive management generally has made a sincere effort to ameliorate the effects of the depression on its workers and that its endeavors have met with marked success considering the limitations imposed by a rapidly declining market.

In drawing these conclusions from the official record, there is no disposition to minimize the hardship which depression has brought to thousands of automotive workers nor to prove that the industry's labor relations during the last few years have been without blemish. On the contrary, the intention is only to emphasize that management has held both payrolls and employment at higher levels than one might expect from an examination of production data.

The story these indexes tell, moreover, is of particular interest at this time when the industry is cooperating in the great economic experiment which the NRA represents, because it is based on facts which will provide the background against which some of the consequences of the industry's enlistment under the "blue eagle" will be measured.

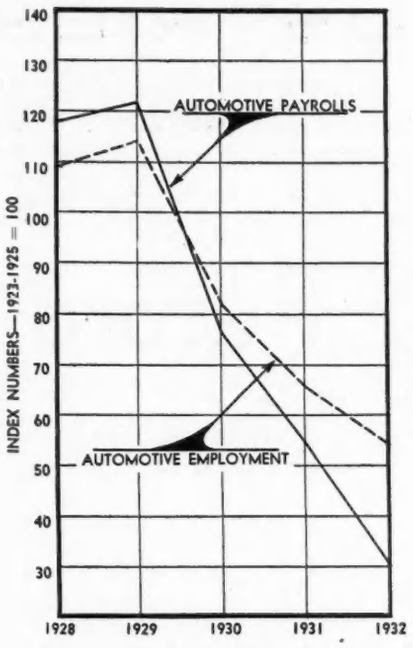
For the time being, the story is complete only through 1932 because all data needed to bring it up to date are not available and such data as are at hand would give results that are distorted by seasonal influences. However, data for 1933 now available give evidence of a general continuation of the tendencies of the last few years.

Using 1929 as a basis of comparison, production in 1932 showed a decline of 75 per cent measured in units and of 78 per cent in wholesale dollar volume. Last year's payrolls, however, were only 75 per cent less than in 1929 which indicates that in 1932 a somewhat larger share of the sales dollar went to labor than in 1929! Moreover, the drop in employment last year as compared with 1929 was but 53 per cent which when compared with the decrease in production, demonstrates that the industry spread employment to give purchasing power to as many of its workers as possible.

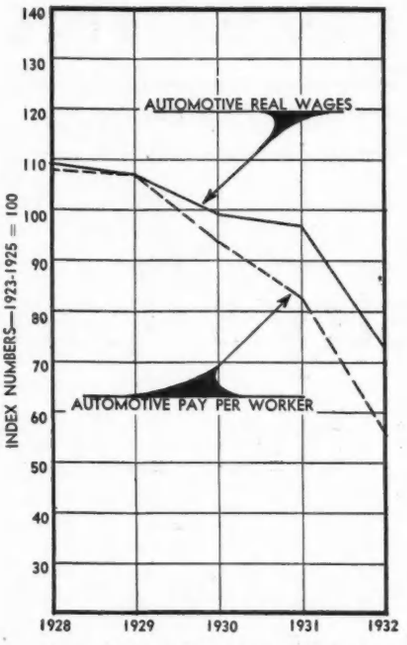
Wages per worker in 1932 were 48 per cent under 1929 but that does not mean, of course, that wage rates were reduced in that proportion. A major portion of this drop unquestionably was due to the industry's "share-the-work" efforts which naturally operated to reduce pay per worker. Moreover, when

1929 and 1932 Compared

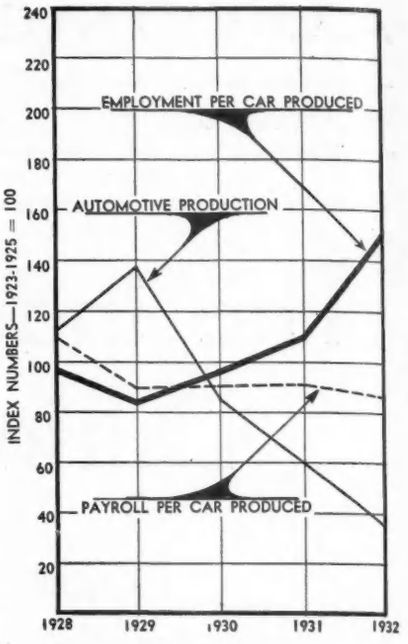
	Index Numbers 1923-1925 = 100		Per Cent Change
	1932	1929	1932 from 1929
Production	34.8	136.7	—74.5
Wholesale Value	29.3	134.5	—78.2
Automotive Payrolls	30.0	122.0	—75.4
Automotive Employment	53.9	114.3	—52.9
Wages per Worker	55.7	106.6	—47.7
Real Wages	73.0	107.2	—32.0
Average Car Price	84.5	98.8	—14.5
Payroll per Car	86.2	89.3	— 3.5
Employment per Car	154.8	83.8	+84.5
Payroll per Dollar of Wholesale Value	102.4	90.6	+13.0
Employment per Dollar of Whlse. Value	184.0	85.1	+116.0



The very much smaller drop in employment than in payrolls is evidence of the extent to which the industry has practised "Share the Work."



The real wage curve shows pay per worker after adjustment for changes in the cost of living resulting from declining prices.

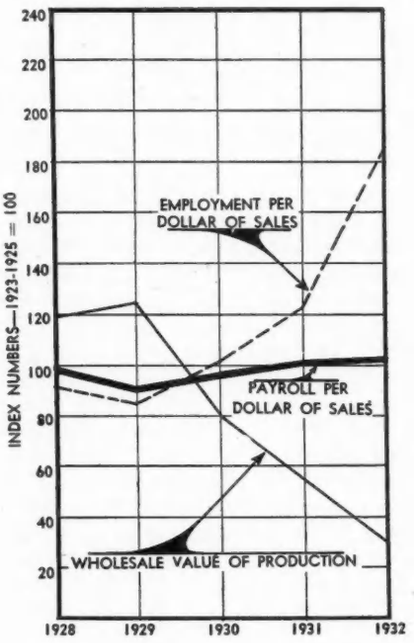


The upward trend in employment per car is a consequence of work-sharing while the drop in payroll per car is due to a decline in the average car price.

adjustment is made for the change in the cost of living during the last four years, the drop in real wages is reduced to 32 per cent.

Automotive payrolls per car produced last year were 3.5 per cent under four years ago. But it is important to realize in this connection that the average wholesale price of a car last year was 14.5 per cent under 1929 due in part to price reductions and in part to the growing share of the market going to the low-priced cars. Consequently the payroll per dollar of wholesale sales is a better measure of labor costs. It showed an increase of 13 per cent over 1929 which means that if in 1929, 10 cents out of every dollar of sales went to labor, in 1932 labor received 11.3 cents from each dollar of factory income. Some of this increase undoubtedly was due to reduced production efficiency resulting from work-sharing.

The number of workers employed per car produced and per dollar of sales actually has skyrocketed since



The "employment per dollar of sales" also reflects work-sharing while the increase in payroll per dollar of sales indicates a rise in direct labor costs.

1929, the increases amounting to 84 per cent in the former case and 116 per cent in the latter. These comparisons are impressive evidence of the extent of "share-the-work" in automotive plants.

If employment had been allowed to drop from 1929 levels in the same proportion as wholesale dollar volume declined, the index of automotive employment last year would have been 25 instead of 54. As a consequence, the pay per worker would have been 120 instead of 58 and real wages would have been 158 instead of 73. This would have meant that last year less than half as many workers would have had more than twice as much to spend Obviously from a social standpoint, the "share-the-work" policy which the industry followed, was very much more humane.

What the final figures for 1933 will show when they become available can only be conjectured. The number of vehicles produced will be

(Turn to page 214, please)

10-Year Record of Automotive Payrolls, Employment and Production

Index Numbers—1923-1925 100

	Payrolls	Employment	Payroll per Worker	Real Wages[1]	Production (Units)	Wholesale Value	Per Car Produced: Payroll	Per Car Produced: Employment	Per $ of Wholesale Value: Payroll	Per $ of Wholesale Value: Employment
1923	101	101	100	102	102	97	99	99	103	103
1924	90	93	96	97	91	89	99	103	101	105
1925	109	106	103	101	108	113	101	98	96	93
1926	105	105	100	99	110	121	96	96	87	87
1927	93	92	102	102	87	101	107	105	92	90
1928	118	109	108	109	112	119	105	97	99	92
1929	122	114	107	107	134	134	89	84	91	85
1930	77	82	94	99	85	80	90	96	96	102
1931	54	66	82	97	60	54	91	110	101	123
1932	30	54	56	73	35	29	86	155	102	184

[1]—Adjusted for cost of living.

Just Among Ourselves

Machine Tool Orders?. YES

MACHINE tool builders often expect to be the first to feel an automotive depression and the last to stop feeling it. Even during a depression, however, engineering progress goes on both in the machine tool and the automobile plants. As a result machine tool buying may develop in reasonable volume much more quickly than some of the more pessimistic among the equipment men seem to think.

The Detroit representative of one important machine tool company, keeping close to the production picture day by day, set out recently to check into buying possibilities on the basis of manufacturing results which might be expected through NRA stimulation of industry in general. He got some answers that will surprise the pessimists. He asked his questions of a representative number of factory production executives.

"Do you expect that within a few months you will be buying machine tool equipment to duplicate equipment which you already have?" he asked. And everybody answered "Yes."

And everybody said they expected to be buying *new* machine tool equipment within 60 to 90 days!

Then he asked: "Do you expect to buy considerable machine tool equipment during the next six months for replacement purposes?" And again everybody answered, "Yes."

Fourth question was: "Do you think the NRA plans are proving successful?" Once more 100 per cent of the answers were "Yes."

On the question: "Do you think that more aggressive sales effort by machine tool builders in the automotive industry is desirable at this time?" 91 per cent replied "Yes."

Now what do you think of that!

* * *

Regarding That Rear-Engined Car

IT'S safe to predict further extension of last year's streamlining tendencies, but automatic transmissions bid fair to arrive slowly rather than quickly so far as numbers are concerned. Experimental interest in fluid flywheels continues — an interest given fresh impetus by announcement that Eaton Mfg. Co. is engaged in development of such a unit in its Wilcox-Rich Corp. experimental laboratories.

Rumors of a rear-engined car of some kind in the New York Show persist, as do those of additional front-drive models, but only time will tell as to their authenticity.

In any case, it is already apparent that definite engineering progress will again have been achieved by the industry in this Year of Our Recovery, 1933.

Road Racing Comes Back

IT is good to see the revival of automobile road racing in the United States under the auspices of men and organizations thoroughly experienced in the handling of such events in the old days.

Never having witnessed personally a road race except in motion picture news reels, we are scarcely competent to comment on the various factors involved in properly running such an event, but our fleeting news reel glimpses have left one very strong impression, namely, that adequate policing of the course is a highly important matter.

This impression is strengthened by recent conversations with some men who actually participated in many of the early American road races. In some of those early events, they tell us, spectators crowded the course, in some cases merely opening up for the car to get through and then closing in behind after it had passed. With the speeds which are obtainable today, the problem of protecting spectators and drivers is manifestly increased.

The Elgin event scheduled for August 26 is under the sponsorship of the Elgin National Auto Race Association which sponsored the original Elgin races prior to 1920 when the last contest was held. The event is sanctioned and supervised by the Contest Board of the A. A. A., while the Chicago Automobile Trade Association and the Indianapolis Motor Speedway are cooperating. Barney Oldfield will be the starter and C. G. Sinsabaugh the referee. Practical experience with successful race operation fairly exudes from every element of this sponsorship. —N. G. S.

New P
of Fi

Measures .00001 in. peaks and valleys and detects irregularities as small as .000001 in very smooth finishes

By E. J. Abbott* and F. A. Firestone†

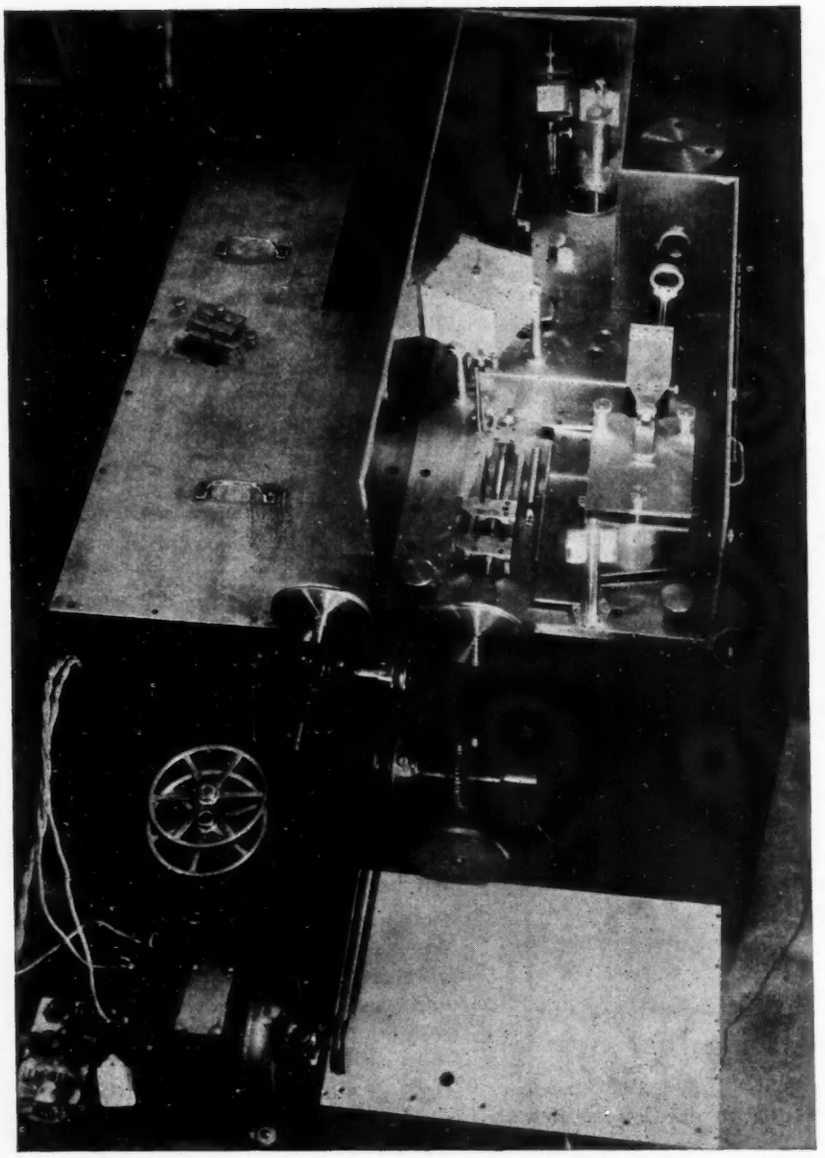
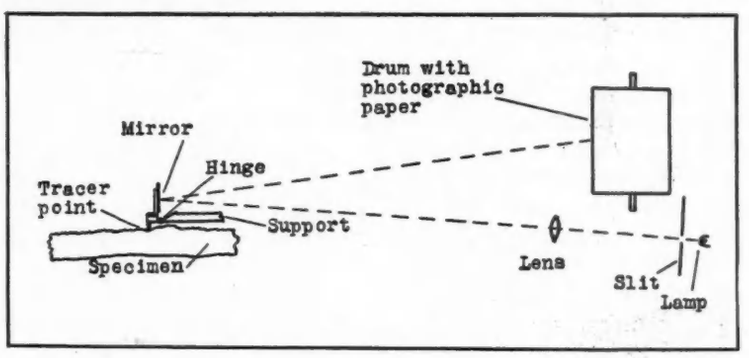


Fig. 1 — Sketch showing operating principle of profilograph and photograph of the laboratory machine



THE quality of the finish of certain automotive parts such as cylinder bores, piston pins, etc., has been receiving a great deal of attention recently, but progress in this field has been greatly handicapped by the lack of means of measurement. As is always the case when dependence must be placed on human judgment, disagreements and uncertainty have been very common. If all surfaces had the same general appearance, and differed only in the magnitude of the roughness, human inspection would be fairly dependable, particularly if specimens could be held side by side for examination. However, surfaces differ greatly in character as well as in magnitude of roughness. This is evidenced by the ease with which different machining operations can be recognized by viewing the surface. Questions such as whether a dull finish pin is smoother than a shiny one, and how much, can hardly be settled by human inspection.

Several years ago the authors encountered the problem of determining the roughness of surfaces in connection with an investigation of gear noise. It was desired to determine the relation between the roughness of the teeth and the noise produced, and since no means was available for determining the former, an instrument was developed for the purpose[1]. Recently

* Research Physicist, Department of Engineering Research, University of Michigan.
† Assistant Professor of Michigan, University of Michigan.

[1] "Test for Smoothness of Machined Surfaces," F. A. Firestone, F. M. Durbin, and E. J. Abbott. Metal Progress, Vol. 21, No. 4. April, 1932. p. 57.

Profilograph Measures Roughness of Finely Finished and Ground Services

this instrument has been improved and the sensitivity increased so that it can be used to measure the roughness of finely ground and polished surfaces.

As shown in Fig. 1, the essential principle of the instrument is very simple. A specimen of the surface to be measured is mounted on a small carriage. Resting very lightly on the surface is a very sharp diamond point which moves up and down over the profile as the specimen is slowly moved horizontally. The movements of this tracer point are magnified by the indicated optical system and recorded on a strip of sensitized paper. A photograph of the actual set-up is shown in Fig. 1A. Obviously this system is incapable of recording the most minute details of the profile, but tests have shown that it is sufficient to record the principal irregularities of finely ground and lapped surfaces with negligible distortion, and without scratching the specimen. This instrument has been called the "Profilograph."

It was found that the irregularities in finely ground surfaces had a depth of about the order of a wave length of yellow light (23 millionths of an inch). In order to obtain a suitable record of these surfaces a vertical magnification of 2000 to 1 was used. This allows irregularities down to about 10 millionths of an inch in height to be measured with reasonable accuracy, and irregularities as small as 1 to 2 millionths of an inch to be detected in very smooth surfaces. Smaller magnification is used on rougher surfaces, such as those produced by boring and milling operations, and these surfaces can be measured as well as the smoother surfaces.

With this instrument the vertical magnification is fixed by the adjustment of the optical system, while the horizontal magnification is determined by the gear ratio between the carriage motion and the drum which carries the sensitized paper. Consequently the magnifications in the two directions may be selected independently. At first thought it might seem that the vertical and horizontal magnifications should be the same so that the irregularities are shown in true proportion. Records have been made with this arrangement, but it was immediately apparent that it was more desirable to use a smaller horizontal magnification so that the record would cover a larger portion of the specimen. In fact this is one of the principal advantages of the Profilograph[2].

The records accompanying this article were made with a vertical magnification of 2000 to 1, and a horizontal magnification of 30 to 1. With this horizontal scale an 8-in. record covers about ¼ in. on the specimen. In order to cover this same distance with a horizontal magnification of 2000 to 1, the record would be about 42 ft. long. In certain cases not shown here, where it was desired to cover feed marks and similar irregularities which occurred three or four times per inch, records were made with a horizontal magnification of 8 to 1, so that the record covered 1 in. of specimen. Therefore, in considering these records, it must be realized that the profiles have been greatly compressed horizontally, and the irregularities are not nearly as sharp as they appear.

All engineers who have seen the instrument have asked two questions:

1. "How many of these wiggles are due to extraneous vibration?"
2. "How well can the curves be repeated?"

The answer to the first question is "None," and to the second is "Perfectly." The latter is illustrated in Fig. 2, which shows a pair of repeat runs on a sample of cylinder wall.

Accompanying this article are records of five different specimens of cylinder bore finishing operations. Some are finish operations and others are semi-finish. These specimens were obtained from various sources. Some were obtained from the manufacturers of the equipment, others were prepared by customers using the equipment, and still others were obtained from routine production. It is believed that the specimens are typical of the operations involved, but no study has been made of sample to sample variations, effects of sharpening tools, and other factors. The curves are presented here, not with an idea of recommending or condemning any operation, but simply to show how large variations exist, and to indicate how much can be learned from actual measurement.

Samples 1 and 2 show examples of final finishing operations on three steel cylinder bore inserts for aircraft engines. Samples 3 and 4 show final cylinder wall finishing operations from manufacturers' production. Sample 5 is an example of the finish produced by a portable tungsten carbide boring equipment for reconditioning cyl-

[2] A similar arrangement was also used by Dr. G. Schmaltz in Germany in an independent development about the same time the original instrument was developed here. "Über Glätte und Ebenheit als Physkalisches und Physiologisches Problem," G. Schmaltz. Zeitschrift des Vereins Deutscher Ingenieure. Bd. 73. Nr. 41, 12 Oktober, 1929. S. 14561.

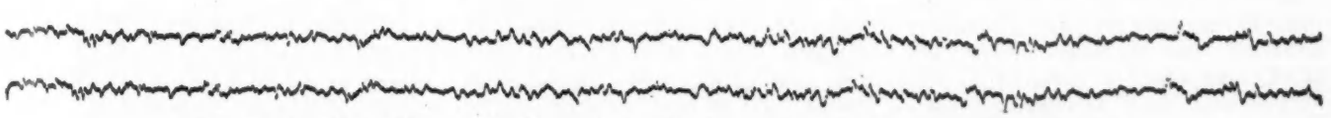


Fig. 2—Profilograph record of honed cylinder bore showing reproducibility of repeat runs. Vertical magnification, 2000 X; horizontal magnification, 30 X. Record is full size

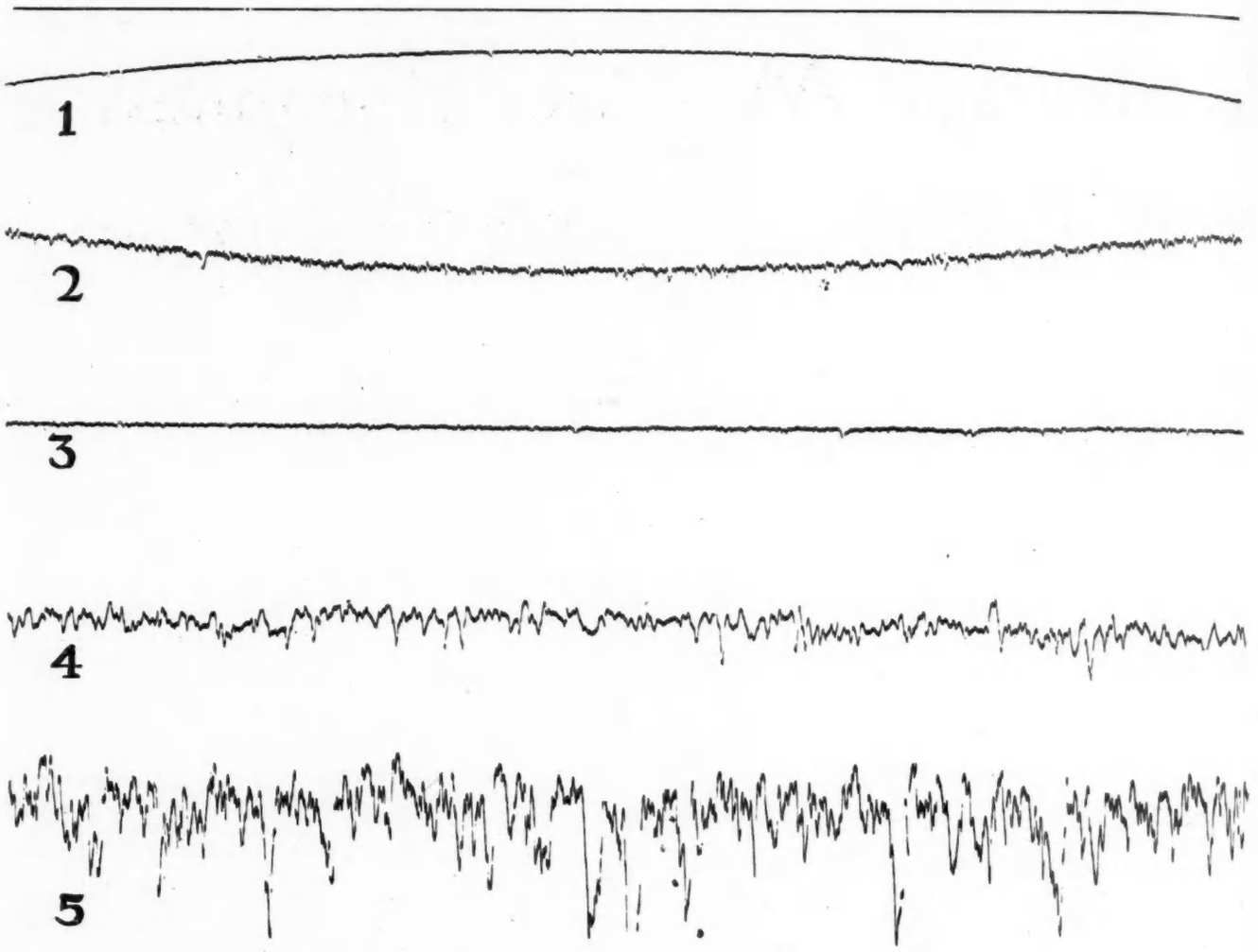


Fig. 3—Profilograph records, full-size, showing condition of cylinder bores finished by various methods. Scale used is vertical magnification 2000 X, where 1/32 = 15 millionths; and horizontal magnification 30 X, where 1/32 in. = 0.001 in.

1. Finish hone on steel insert for aircraft cylinder.
2. Finely ground bore on steel insert for aircraft cylinder.
3. Finish-honed cylinder, cast iron, automobile manufacturer A.
4. Finish-honed cylinder, cast iron, automobile manufacturer C.
5. Cylinder bored with portable hard metal boring equipment used for reconditioning. Final operation with many operators.

inders. Some operators use these as final operations. All of these records are to the same scale: vertical magnification 2000, horizontal 30. This corresponds to 1/32 in. = 15 millionths vertically, 1/32 in. = 0.001 in. horizontally.

It will be observed that several of the specimens show a distinct bow. Both convex and concave curvatures of this type have been observed, and they are apparently due to warping of the specimen when it was removed from the block, and are not believed to be significant. It will be observed that the curvature is only a fraction of a thousandth over the ¼ in. of measured length.

The differences in the profile curves of the surfaces just discussed are sufficiently striking that a great deal of information can be obtained by simple inspection. However, one immediately finds the need for numbers to describe how much the surfaces differ. Such description is more difficult than might at first appear on account of the complex form of the profiles, and the materially different character of the profiles of different surfaces. This is shown to a considerable extent by samples here shown, and it is even more striking when specimens of different operations such as boring, milling, etc., are included. Therefore, it is necessary to include in the numerical specification some description of the character of the surface. A method for accomplishing this has been devised by the authors, and a description of it is given in a paper "A Method of Specifying Surface Roughness in Physical Units," which will appear in an early issue of *Mechanical Engineering*. Some of the conclusions of this paper are briefly summarized in the following paragraph.

The specification is made in terms of familiar units, namely the inch. For more convenient numbers, the values are expressed in microinches (one microinch = 0.000001 in.). It will be observed

from the curves that the profiles consist of three parts: a portion which consists of peaks which extend above the body of the curve, a section which consists of valleys which extends below the body of the curve, and the third central section which includes most of the irregularities. These three sections have been called the "Peak," "Medial" and "Valley" sections and they are defined as follows: Imagine a line drawn parallel to the surface which just intersects the profile curve across a few of the highest peaks so that 2 per cent of the line lies in metal and the remainder in air. Now imagine that this line is moved down parallel to itself so that 25 per cent of its length lies in metal. The distance between the two positions of the line is called the "Peak Roughness." Similarly the "Medial Roughness" is the distance between the position where 25 per cent of the line lies in metal to the position where 75 per cent is in metal, and the "Valley Roughness" the distance from the 75 per cent position to the 98 per cent position. A more complete discussion of the reasons underlying this particular choice of specification, together with methods of applying it to actual profile curves, is in the paper mentioned above.

This method of specification has been applied to over 50 profile curves of various surfaces exhibiting extremely different character and magnitude of roughness, and in every case it appears that this method sufficiently describes the magnitude and essential characteristics of the surfaces. The method is simple, flexible, based on familiar and easily understood units, and it is hoped that it will find application in many of the everyday problems of the industry.

As stated above, the present instrument is a laboratory model and is designed to measure comparatively small specimens. This is obvously a disadvantage in many possible applications, particularly for routine inspection, and the authors are considering modified instruments which will be adapted for factory use or for almost any purpose for which measurements of smoothness or of fine profiles are required.

Bureau of Standards Report on Alcohol's Solubility in Gasoline

Preparatory to an investigation of agents designed to increase the solubility of hydrous alcohol in gasoline, the Bureau of Standards considered it desirable to obtain a comprehensive set of data on the solubility in a number of gasolines of ethyl alcohol containing various percentages of water. Information obtained in this preliminary investigation, in which eight different gasolines were used, including data obtained on the temperatures below which ethyl alcohol containing up to 8 per cent of water is not completely miscible with each of these gasolines when blended in various proportions from 10 to 90 per cent of gasoline, is contained in Research Paper No. 560 of the Bureau of Standards entitled "Critical Solution Temperatures of Mixtures of Gasoline, Ethyl Alcohol, and Water," by Oscar C. Bridgeman and Dale W. Querfeld.

The experimental data obtained led to the following three general conclusions:

1. With any given percentage of gasoline in the mixture between 10 and 90 per cent, the critical solution temperature rises as the percentage of water in the ethyl alcohol increases.

2. With any given ethyl alcohol solution, containing from 1 to 8 per cent of water, the critical solution temperature rises as the percentage of gasoline in the mixture is increased.

3. With any given percentage of gasoline in the mixture between 10 and 90 per cent, and with any given ethyl alcohol solution containing from 1 to 8 per cent of water, the critical solution temperatures differ considerably with various gasolines.

The differences in the critical solution temperatures with various gasolines are due to differences in composition. Such differences may be associated partly with differences in volatility and partly with differences in the crude from which the gasoline was refined and the type of refining process used. Consideration of the data for two straight-run gasolines (Nos. 2 and 3) of about the same volatility, shows that the critical solution temperatures for these two gasolines do not differ much, even though they are refined from different crude oils. A similar conclusion is reached on comparing the data for two other gasolines, Nos. 5 and 6, which also have about the same volatility. While these conclusions are suggestive as regards the relative effects of volatility and source of crude oil, the data do not permit the quantitative evaluation of these two effects independently.

The present data indicate definitely that separation would occur at any temperature below 0 deg. C. with any of the gasolines investigated when mixed with less than 50 per cent of ethyl alcohol, unless the alcohol contains less than 3 to 5 per cent of water. Even this concentration of alcohol leaves no margin of safety for absorption of moisture from the air after mixing and while in the supply tank of the automotive vehicle. A margin of safety is particularly desirable since separation into two liquid layers occurs at a temperature immediately below that at which turbidity is noted. With provision for a margin of safety to compensate for absorption of moisture, the alcohol used would have to be almost entirely free from water in order to prevent separation even at 32 deg. F. Since it is believed that the gasolines investigated cover the range of gasolines commercially available, it is considered that addition of other substances to increase the solubility of the alcohol is necessary if gasoline-alcohol mixtures that will not separate in service are to be obtained, unless alcohol almost entirely free from water is employed. Information on the effectiveness of added substances in increasing the solubility of alcohol in gasoline, and on the required margin of safety against absorption of moisture from the air in service, is necessary before any safe estimate can be made of the highest permissible water content of the alcohol.

DECREASED PRODUCTION and Scientific Management Make PROFIT

RECENTLY the chairman of the board of one of the best known alloy steel mills announced that his company had so arranged its affairs as to show an operating profit at only 35 per cent productivity. Moreover, with the same setup, the company expects to maintain its cash position even when the productivity drops to 25 per cent.

This is but one shade in the ever-changing pattern of current activity in management circles. It serves to focus attention upon the need for a thorough-going analysis of all expense accounts, not alone in the production departments which have been the target of most management activity, but in other directions such as general administrative expense, sales promotion, services, research, and distribution.

While it may sound elementary, the profit possibilities of any company depend upon a judicious balancing of total expense and gross income from sales. And, in the present complexity of industrial organizations, it is difficult—if not impossible — to make the delicate adjustments in these accounts without the aid of some efficient and understandable tool.

Such a tool is exemplified by the so-called "profit engineering" method which has been preached by many outstanding management engineers in the past few years. One of its best points is the visual representation of the mechanical balance of all important factors by means of the "break-even" chart.

Perhaps the most lucid picture of the method was given by Prof. Walter Rautenstrauch in a paper read at the last annual meeting of the American Society of Mechanical Engineers[1]. The author explains that "Upon examining the items of the total costs or expenses of possessing and operating a manufacturing business, we find that certain ones are not affected by the rate of production or the volume of goods produced in a given time period. These items are rent, fire insurance, taxes, depreciation, interest on borrowed money, and certain salaries and other expenses which are fixed by executive policy. It is important to note that some are constant as, for example, rent, taxes, fire insurance, depreciation, and interest on borrowed money; others, such as salaries and expenses for advertising, are determined by executive policy. The latter may be changed to lower or higher levels if the management so elects. The former can be changed between certain limits only by the reorganization or redesign of the factory.

"Therefore, while a business when examined at any particular time will be found to be operating with certain constant total costs, it is to be noted that a portion of these costs admit of being raised or lowered by executive action and others are determined by the design features of the factory, the machinery of manufacture and the financial structure of the enterprise."

Such costs are accompanied by other total costs which tend to vary directly with the volume of business done during a given period of time. These may be called Variable Total Costs and include, chiefly, material and labor. Other costs, such as the salaries of salesmen, power consumed, expense materials, etc., are partly fixed and partly variable. Close scrutiny is needed in each case to determine their exact nature.

Without going into details, we

[1] "The Economic Characteristics of the Manufacturing Industries" by Walter Rautenstrauch, Prof. of Industrial Engineering, Columbia University, *Mechanical Engineering*, Nov., 1932.

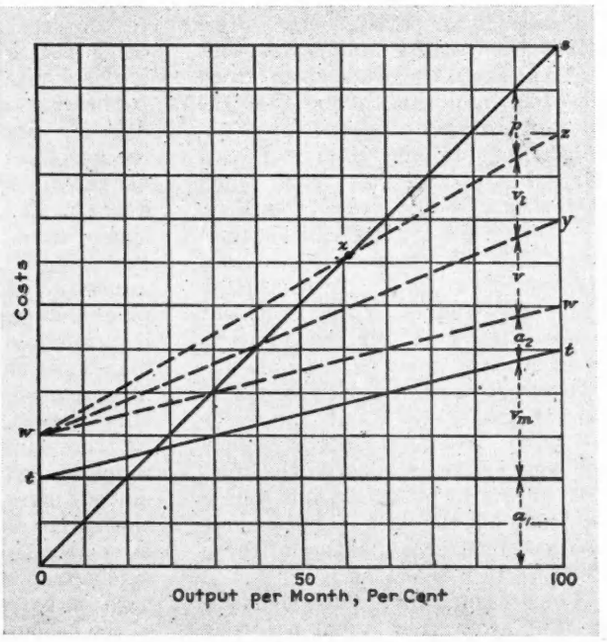


Fig. 1—Break-even chart shows method of reducing overhead in face of declining sales.

by Joseph Geschelin
Engineering Editor, Automotive Industries

FIT POSSIBILITIES

The "Break Even" Chart is considered by some as the most important single element in profit-engineering

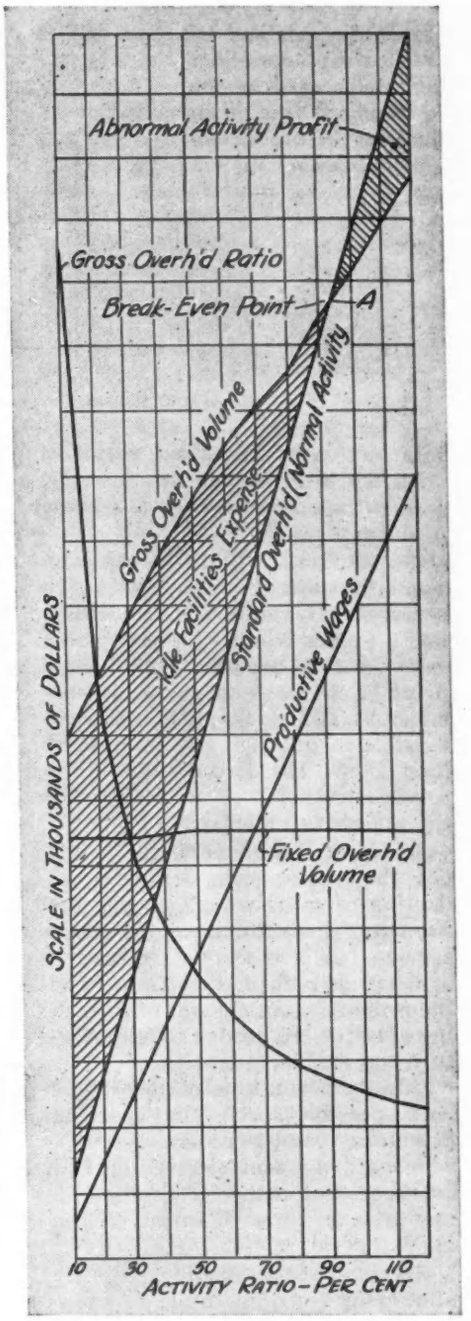


Fig. 2 — Management gets a quick picture of operating history from this analysis. An unusual feature of the graph is the area marked "Idle Facilities Expense" which shows the penalty of small activity ratios

can examine the "break-even" chart as described by Prof. Rautenstrauch, since it constitutes the most important single element in profit engineering. The generalized form of this chart is shown in Fig. 1, the significance of the symbols shown being defined as follows:

A_1 = sum of total costs as insurance, taxes, interest and depreciation.

A_2 = constant total costs arising from decisions made about running the business. The value of A_2 may be changed but will be constant as determined by particular policies.

Vm = the total cost of direct materials for a given quantity of production.

By constructing the constant total cost line, A_1, and the variable total cost line arising from Vm, we define a line of total costs, t-t, which is, in effect, a base total cost which cannot be lowered for the particular business.

The line WW drawn through A_2 and parallel to t-t defines the lower level of total cost which varies according to executive decision due to changing business conditions.

V = variable total costs which arise from the use of indirect materials and indirect labor in the factory, from the payment of commissions on sales, and because of other services. The relation of these costs to output may be included in the chart by constructing the line W-Y so laid out that the distance W to Y at the right will be equal to the amount of such costs when the plant is run at 100 per cent capacity for one month.

Vl = the variable total cost due to direct labor. The line showing these costs is Y-Z so constructed that the distance Y to Z shall equal the direct labor cost when the plant is run at 100 per cent capacity for one month.

W-Z by construction is the terminal of the ordinate which measures from the base the total cost incurred at varying outputs per month.

S = the sales value of the product manufactured during the month when the plant is run at 100 per cent capacity, the line O-S representing the sales values of the unit produced at the corresponding capacities or output.

X = the break-even point, the point of vanishing profit. It is the

Table I — Method of calculating variations in total normal money depending upon fluctuations in productive labor

1	ACTUAL Direct Labor (Dollars)	2 Col.4 & Col.5 Normal (Dollars)	3 Ratio Col.2 to Col.1 Normal Percent (Variable)	4 Fixed Charge Non-Variable Normal (Dollars)	5 Col.1 x Col.6. Variable Normal (Dollars)	6 Rate (Percent) (Fixed)
Basic Estimate	47500	32500	68.4	6000	26500	55.8
ACTUAL EXPENSE	40000	28300	70.8	6000	22300	55.8
	30000	22730	75.8	6000	16730	55.8
	50000	33900	67.8	6000	27900	55.8
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intersection of the total cost line with the total income line.

T = the profit for a given volume of output.

An analysis of the break-even chart indicates the necessity for a comprehensive analysis of all costs and a proper balance between these costs so as to produce a break-even point below the level of current activity. Whether or not it is always feasible in practice, the analysis at least shows the direction in which total costs should go with shifts in the index of productivity.

As Prof. Rautenstrauch points out, the real problem is not the reduction of overhead alone, nor the arbitrary discontinuance of certain service, but it is the determination of what amount of direct labor and the proportionate amount of attending services are needed to manufacture the smaller quantity of goods within the given time period, at the least possible cost. The problem, therefore, is not to reduce A_2 and V which are the controllable items of overhead, but rather to establish a new A_2 and a new V in proportion to Vl.

Recent examples of the possibility of varying constant total costs represented by A_2 are too well known to executives to require repetition. The most important of these have been the revaluation of capital assets, changes in depreciation charges, and general wage cuts. Also, a diminution in or elimination of certain services.

Executive decision in the matter of changing the level of variable costs necessarily must be based on an intimate knowledge of operating conditions and the effects of such changes upon the operating statement of various activities. Thus the general revaluation of capital assets, described in *Automotive Industries* recently[2], to be a sound move in fact, is presumed to be based upon the change in replacement values and the level of prices in the second hand market. The consequent drop in book values and reduction in depreciation charges undoubtedly have a profound influence upon the ability of the production department to produce at a profit at existing levels of productivity.

However, arbitrary executive decisions often impose a hardship on the production department. Take this example mentioned in recent correspondence by the Works Manager of one of the large automotive parts plants. "As a specific instance, take our power house. When we first came to this company it was depreciating approximately $5000 a month and was raised to $9000, it was raised to $11,000, it was raised to $17,000, and in the last three years it was raised to $32,000 and now has been reduced in the last year to $18,000 per month. This applies to a lot of other departments and to a lot of other companies, therefore, by depreciation, although a division is running efficiently, it will create an increased expense in the operations of these divisions if they juggle their depreciation."

That the break-even chart as a tool or as an aid to profit possibilities is really a practical device and not simply an academic dodge, is indicated by a practical application in the SKF industries as described in *Automotive Industries* a year ago[3]. Fig. 2, taken from this article, shows the form of break-even chart used in conjunction with the budget system in operation at the Hess-Bright Mfg. Co., Philadelphia. In this plant all the activities of the company are controlled by a comprehensive budget system, the budget being prepared month by month in advance so that there are really twelve budgets to a year. It is set up on the basis of previous experience plus the suggestions of all interested department heads. Burden accounts are segregated and a series of par values established for each item for production load capacities referred to as operating hours ranging from 10 to 120 per cent of normal activity.

If we examine Fig. 2 it is readily seen that the break-even point is profoundly affected by the volume of idle facilities expense which increases markedly with the decrease in activity ratio. The recent tendency to write down assets and decrease depreciation charges if applied to this chart would result in a decrease in the shaded area below the break-even point, a change in the slope of the gross overhead volume of line and the consequent downward shifting of the break-even point.

In 1931, the operation of this budget system aided by the graphic control resulted in a saving on two accounts alone as follows:

Maintenance—30 per cent
Indirect Payroll—15 per cent

One of the most interesting experiments in profit engineering as applied to factory operations was incorporated in an experimental budget control at the Oakland plant in 1930 and described in *Automotive Industries* at the time[4]. This budget control extended to all activities including direct cost, but the article in question concerned chiefly the control of overhead items such as indirect labor and expense materials.

The key to the operation of this control is the establishment of a "normal," which is an estimated value established on the basis of previous experience and in the case of indirect activities, represents the maximum indirect expense in proportion to the direct labor outlay in each department for each production division. It is a flexible quan-

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The first line marked "basic estimates" shows the initially estimated figures for a specific department, assuming an estimated direct labor outlay of $47,500 and a permissible normal expenditure of $32,500, which is 68.4 per cent of direct labor. Column 4 shows the non-variable normal, or fixed charge element of overhead burden, which is an actual figure to be used throughout. In the initial calculations, therefore, the difference between Column 2 and Column 4 represents the variable normal, which in this case is 55.8 per cent of direct labor. This percentage is also fixed and is used in the succeeding calculations.

Now for this same department let us assume values for actual expenses as shown. They may be anything above or below the estimate, our object being solely to show how the results are interpreted. Just to illustrate the point, consider the first item of $40,000—the others being treated in exactly the same way. As indicated by the operation at the top of Column 5, the product of the fixed rate, Column 6, multiplied by direct labor dollars, gives the value of the variable normal, variable only because it changes with the actual expense. Adding Column 4 to Column 5 we get the value in Column 2, representing an expense normal whose ratio to direct labor is 70.8 per cent. Obviously then, this new figure (70.8 per cent) will be used in making up the monthly report, instead of the previously estimated percentage of 68.5 per cent.

Looking at this from another angle we get a truly interesting picture. If we consider only the bare figures in Column 3 with an estimated normal of say 68.4 per cent, the readjusted normal increases as the actual direct labor drops below the estimate, and decreases as the actual direct labor goes above the estimate. Off-hand we might be inclined to interpret these variations from the normal as indicating better or poorer economy. Actually, these percentages indicate unvarying efficiency, since the "variable" normal efficiency by the rate in Column 6 is fixed and is absolutely the same throughout.

As is well known, budgetary control forms one of the most important activities of factory management in the automotive industry. At various times we have described the systems in use at Studebaker, Timken-Detroit Axle Co., and at other plants. But there seems to be a fertile field for the extension of these budget controls to the other activities of management in both large and small organizations.

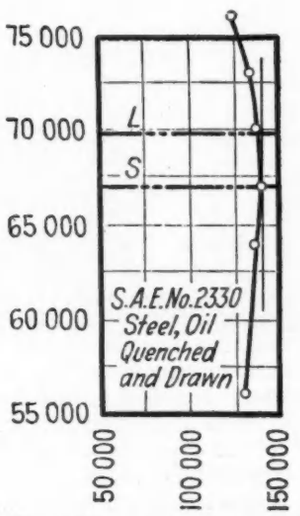
According to the suggestions made by a number of works managers with whom we have discussed the matter recently, there is an urgent need for a better understanding of the production department's problems by the fiscal officers of the company. A better appreciation of these problems should make the operation of a budget more certain of success and more favorable to profitable operations at low rates of activity.

An "Over-Night" Endurance-Limit Test

A NEW method for determining the endurance limit of metals "over night" has been developed by Professor H. F. Moore and H. B. Wishart, both of the University of Illinois, and was described by them in a paper read at the annual meeting of the American Society for Testing Materials. It is based on the following principle: Under cycles of repeated stress metals exhibit two opposing tendencies, viz.:

(1) a tendency to increase of strength due presumably to cold work, and (2) a tendency to loss of strength due to the spread of fatigue damage by cracks or otherwise. Below the endurance limit the beneficial influence predominates, above the endurance limit the beneficial influence of cold work predominates for a time, but the fatigue cracks formed grow, at first slowly and then more and more rapidly, and the destructive influences finally cause fracture, sometimes only after hundreds of millions of cycles of stress.

This general idea was embodied in the following test. Using five or six fatigue specimens, subject each of them to a number of cycles of a definite stress, but let the magnitude of the cyclic stress for different specimens vary from a value well below the estimated edurance limit for the least stressed specimen to a value well above the estimated endurance limit for the most heavily stressed. After the given number of cycles of stress have been applied remove the specimens from the fatigue testing machines and determine the tensile strength of each. For the specimens which have been subjected to cyclic stress below the edurance limit the tensile strength will either be increased or practically unaffected; for the specimens in which fatigue damage has made appreciable progress the tensile strength will be reduced. Plot a curve with magnitude of cyclic stress applied as ordinates and tensile strength after application of a given number of cycles of repeated stress as abscissas (see Fig. 1). If the period of cyclic stressing has been sufficiently long to develop appreciable fatigue damage in those specimens which have been subjected to cyclic stress above the endurance limit, then the endurance limit is represented by the ordinate corresponding to the maximum abscissa.



In Fig. 1 "L" represents the endurance limit by the long-time test; "S", the endurance limit by the over-night test

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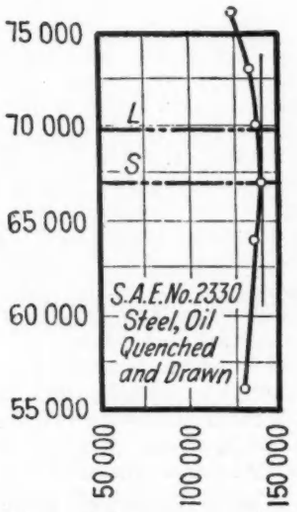
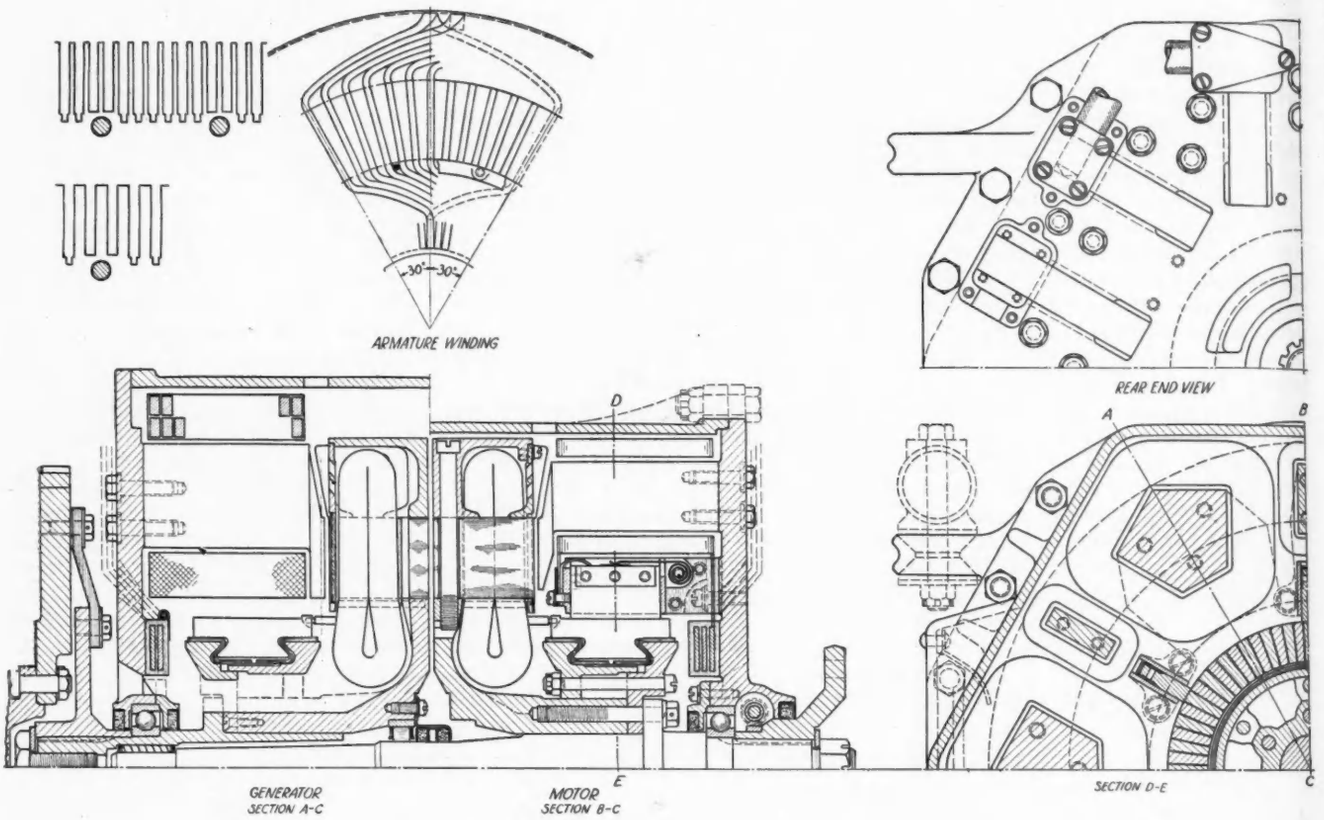
This general idea was embodied in the following test. Using five or six fatigue specimens, subject each of them to a number of cycles of a definite stress, but let the magnitude of the cyclic stress for different specimens vary from a value well below the estimated edurance limit for the least stressed specimen to a value well above the estimated endurance limit for the most heavily stressed. After the given number of cycles of stress have been applied remove the specimens from the fatigue testing machines and determine the tensile strength of each. For the specimens which have been subjected to cyclic stress below the edurance limit the tensile strength will either be increased or practically unaffected; for the specimens in which fatigue damage has made appreciable progress the tensile strength will be reduced. Plot a curve with magnitude of cyclic stress applied as ordinates and tensile strength after application of a given number of cycles of repeated stress as abscissas (see Fig. 1). If the period of cyclic stressing has been sufficiently long to develop appreciable fatigue damage in those specimens which have been subjected to cyclic stress above the endurance limit, then the endurance limit is represented by the ordinate corresponding to the maximum abscissa.



In Fig. 1 "L" represents the endurance limit by the long-time test; "S", the endurance limit by the over-night test

Unit Generator-Motor in New Transmission



Details of the Hobart electrical transmission

AN electrical transmission for use on motor vehicles, in which the generator and motor are combined in a single unit, has been designed by John P. Hobart who conducts a development-engineering service in Cincinnati, Ohio. Sectional views of the conversion unit are shown herewith.

The armatures are of pancake shape, generator and motor armatures being set back to back. Their cores are made by winding strip steel on the armature spiders. The armature coils are fan-shaped and set in slots in the front face of each armature. The commutator is of small diameter and mounted on an extension of the armature spider.

The field poles and coils, together with the commutation poles, surround the commutator, with steel end rings or yokes of small diameter holding all field poles in place and forming a magnetic path from one pole to another. The outer shell is of aluminum alloy, and the shafts are mounted on ball bearings making a rugged and easily-serviced unit. The magnetic paths are reduced to the minimum; the heavy return path in the armature is eliminated and the field yoke, which heretofore was usually on the outside and necessarily heavy, is reduced to a ring of small diameter. The entire machine is designed for forced ventilation and will have the same overload capacity as a street railway electric motor. A 75 hp. unit will measure only about 21 in. from the rear face of the engine to the universal joint (which is comparable to a present-day assembly of clutch and flywheel housing, transmission cases and free-wheel unit), and the diameter of the housing is about 17½ in.

Among the advantages of such an electric transmission are that it is entirely automatic, the transmission ratio depending only on the speed of the engine and the torque necessary to drive the car; that the drive is quiet throughout the whole speed range, and that the transmission can be used as an electrodynamic brake in hilly districts, thus saving the mechanical brakes.

Mr. Hobart believes a transmission of this type will open up new possibilities in engine design and will be especially desirable for cars with rear-mounted engine.

Brake Lining for Buses

A new brake lining designed particularly for use on buses and trucks, but said to be equally applicable to passenger cars, has been announced by the Russell Manufacturing Company, Middletown, Conn. It is known as Rusco woven molded slab-stock lining.

Woven of long-fiber asbestos and long brass wire, the slab-stock lining is molded to a definite arc under great pressure, whereby its density is increased. It is held together by its weave rather than by its treatment. The brass wire being in continuous strands is said to act as a heat conductor, helping to dissipate the heat from the drums, thereby tending to reduce drum expansion, "pedal fade," spot contact and drum scoring.

Coincidence or Consequence?

In its issue of February 4, 1933, Automotive Industries described the New Plymouth plant on which Chrysler was reported to have spent millions. On Aug. 5, Automotive Industries reported that Chrysler second quarter profits had jumped to $7,785,616!

Shore Plant to Make Bromine From Sea Water

THE first manufacturing plant ever to be constructed on shore for recovering bromine from sea water is now being built at Kure Beach, about 20 miles south of Wilmington, N. C., by the Ethyl-Dow Chemical Co., a new company formed jointly by the Ethyl Gasoline Corp. of New York and the Dow Chemical Co., Midland, Mich.

The output will be utilized entirely by the Ethyl Gasoline Corp. as a constituent of Ethyl fluid.

The Ethyl-Dow plant is being built in units, each having a monthly capacity of 250,000 pounds of bromides. To produce 500,000 pounds of bromine a month, it is necessary to process the seawater at the enormous rate of 26,000 gallons per minute for 24 hours a day. The water is actually in the plant process less than a minute, during which time it undergoes chemical treatment, loses its small trace of bromine, and is on its way to the waste outlet, the Cape Fear River.

The latest process developed by chemists and engineers of the Dow Company involves treating the seawater with enough chlorine to convert the bromides in the water to free bromine. This bromine is blown out of the seawater by a current of air. The air containing the bromine is then brought into contact with soda solution which absorbs the bromine, forming a concentrated solution of bromide-bromate.

This new plant, it is expected, will be in operation in about six months. Its location at Kure Beach followed an extensive study of geographical conditions, the production process requiring a supply of clean seawater not diluted with surface water and not containing too much organic matter, as well as a convenient means of disposing of the waste water without allowing it to dilute the intake.

University Tests Farmall F-12

THE official report of tractor test No. 212 has been published by the University of Nebraska recently, the test having been made May 1 to 10 on a McCormick-Deering Farmall F-12, manufactured by the International Harvester Company of Chicago.

The tractor is equipped with a four-cylinder vertical, valve-in-head engine produced by the tractor manufacturer himself. It is mounted lengthwise on the tractor. Bore and stroke are 3 in. and 4 in. respectively, and the engine has a rated speed of 1400 r.p.m. Both valves have port diameters of 1 3/16 in. The belt pulley has a diameter of 12⅜ in. and a face width of 6¼ in., and it runs at 800 r.p.m.

The tractor is of the three-wheel type, two of the wheels being driven—through enclosed gearing. A Rockford single-plate dry clutch is fitted and is foot-operated. The transmission gives three forward speeds, the advertised speeds being 2¼, 3 and 3¾ m.p.h. forward and 2¼ m.p.h. reverse. Drive wheels are 54 in. in diameter and have a 6-in. face. Each wheel is equipped with sixteen spare-type lugs, 2½ in. wide by 4 in. high. Six-inch extension rims are furnished which carry the same lug equipment as the wheels themselves. A pressed steel seat is furnished. As tested, with operator, the tractor weighed 3280 lb. In the tests the tractor was operated on gasoline. The oil used was of S.A.E. No. 30 viscosity. The amount supplied to the engine was 1.950 gallons, the amount drained off, 1.275 gallons, this latter quantity being drained off at the end of the test, which extended over 47 hours.

In the operating-maximum-load test for one hour the engine developed 16.20 hp. at 1399 r.p.m., fuel consumption being at the rate of 0.649 lb. per hp.-hr. In the rated-load test the engine developed 14.61 hp. at 1398 r.p.m. with a specific fuel consumption of 0.654 lb. per hp.-hr. In the variable-horsepower test, which extended over 2 hours, the engine developed an average of 9.06 hp. at 1418 r.p.m., with a specific fuel consumption of 0.822 lb. per hp.-hr.

In the rated-load drawbar test, in intermediate gear, extending over 10 hours, the tractor developed a drawbar pull of 1172 lb. at a speed of 3.23 m.p.h., corresponding to 10.09 hp. Slippage of the drive wheels was 2.61 per cent, and the fuel consumption was at the rate of 0.986 lb. per drawbar hp.-hr. In the maximum-load test the tractor developed a drawbar pull of 1870 lb. at 2.34 m.p.h. (11.68 hp.) in first gear; 1442 lb. at 3.20 m.p.h. (12.31 hp.) in second gear, and 1091 lb. at 4.14 m.p.h. (12.03 hp.) in third gear.

The Industry's Labor Record

(Continued from page 202)

substantially ahead of last year. This gain, however, will not be paralleled by a proportionate increase in dollar volume due to the predominant popularity of the low priced car and dollar volume probably provides a better comparative measure of production than unit output. However, despite these elements of uncertainty, it seems certain that both employment and payrolls will be higher than in 1932—how much is anybody's guess. It is more than probable that pay per worker will be higher also, particularly in view of the NRA experiment and also because so far this year the indications are that the average worker has been employed more hours per week.

So far as the automotive industry is concerned the real test of the NRA experiment to increase employment and payrolls is likely to be deferred until 1934. With the annual clean-up just around the corner, higher prices on this year's models seem improbable, but they are regarded as inevitable on 1934 models because of higher costs. Consequently the real test will come next year when the public's reaction to the higher prices will provide the answer.

Jobbers' Code Would Control Parts and Equipment Wholesaling by Car Factories

Provides for the Regulation of the Wholesaling Function as Well as of Wholesalers of Automotive Merchandise—Sales Below Cost Are Prohibited

DETROIT—Wholesale distribution of replacement parts, accessories and shop equipment by car distributors and presumably by car factories, as well as by automotive jobbers, will be controlled by the code of fair competition of the wholesale automotive industry if it is approved by NRA as submitted. It is expected, however, that this and other points in the code affecting car factories and their dealers, will be submitted to the N.A.C.C. and N.A.D.A. for approval.

The code covers the wholesale distribution of automotive merchandise which term is defined as follows:

". . . any and all parts, equipment, tools, accessories and supplies used in the repair and maintenance of automotive vehicles, tractors, trailers, stationary internal combustion engines and aeronautic and marine engines, excepting tires and petroleum products. . . . It shall include 'Shop Equipment' and 'Tools,' as those terms are commonly understood . . . ; and the sale of such to any and all automotive repair and maintenance establishments shall be deemed wholesaling of same."

Previously the code says that the term automotive merchandise shall not be construed to include the complete automotive vehicle or engine, but that it shall include the accessories attached to the vehicle or engine if they are separately priced and charged for insofar as the sale from the wholesaler or distributor or from the vehicle or engine maker direct to retail outlet is concerned.

The code is applicable to all who qualify under a reasonable interpretation of the following definition of automotive wholesaler:

"An automotive wholesaler is a person, partnership, and/or corporation actually engaged in the buying of automotive merchandise and in re-selling of such merchandise to retailers, who maintains a regularly established place of business, who carries a merchandise inventory enabling him or it to supply the reasonable demands of the clientele served, and who generally performs the recognized functions of a wholesaler in a manner acceptable to his or its suppliers on the one hand and to his or its customers on the other."

This definition is supplemented by rules which follow in part:

"(1) The buying of merchandise in wholesale quantities for the purpose of and the reselling of same to retailers is the distinguishing mark of a wholesaler.

"(2) Whenever a person, firm and/or corporation engaged in the production of automotive merchandise assumes the recognized functions of the wholesalers of such merchandise, the buying of materials out of which products which he wholesales are fabricated constitutes 'buying of automotive merchandise in wholesale quantities' within the meaning of the above definition and, insofar as related to the sale to retailers of said products, his status shall be of the wholesaler.

"(3) Transfer of automotive merchandise in wholesale quantities between and among subsidiaries and affiliated concerns for the purpose of reselling same to retailers shall constitute 'buying of automotive merchandise in wholesale quantities,' as contemplated in this definition.

"(4) The machining of automotive products as generally performed in machine shop operations of automotive wholesaler establishments for the retail customers of said establishments and the supplying of same to said retailing customers shall be deemed doing a wholesale automotive business within the meaning of the above definition."

These definitions obviously are extremely broad in scope although they apparently do not include the wagon peddler as he probably would not be construed as maintaining a regularly established place of business.

Administration will be through an Administrative Committee representative of the M.E.W.A., N.S.P.A., N.A.P.A., A.E.R.A., and A.E.A. on a 5-5-3-3-3 basis. These, of course, are the associations which cooperated in the development of the code. Each federal reserve district is made an NRS Wholesale Automotive District with local groups in each district as may be necessary. From the Administrative Committee an executive committee of five will be selected.

The maximum hour provisions provide for 44 hours average with 48 hours in an emergency, with traveling salesmen and executives excepted. The minimum wage is set at 35 cents with a minimum of 30 cents for incidental workers and learners. An endorsement of the open shop policy is contained in the code.

The code provides for the establishment of a basic chart of standardized account headings covering all costs and expenses and including a charge of 6 per cent for interest on investment. Sales below average fair and reasonable cost as ascertained in this manner, is unfair competition.

Under trade practice rules, the code provides for resale price maintenance by manufacturers of branded products and for price regulation by wholesalers. Misbranding, misrepresentation, commercial bribery, discrimination between territories and in credit terms are all made unfair competition. So is "acceptance of orders for large quantities of merchandise by wholesalers and then making smaller deliveries at the larger quantity price." Close-outs at special prices are permitted under the supervision of the district secretary who also have supervision over consigned shipments to retailers. The National Administrative Committee is given power to regulate bulk selling.

Under the fair practice heading also is a section on classification of customers. It reads as follows:

"To prevent unfair methods of competition, a fair and equitable classification of customers shall be made by each district or local group and such classification shall be strictly adhered to by all operating in that group. The above classification of customers shall include fleet owners, car distributors, car dealers, independent repairshops, machine shops not qualified as wholesalers, service stations, filling stations, battery and tire shops, electrical repairshops, governmental agencies . . . , chain stores, mail order houses, accessory and supply stores, and other forms of retail units as may appear."

The code does not state the purpose of this classification except that it amplifies the definition of the term "retailer" as used. Whether this classification also will be used, as might be inferred, to establish discount practices for the different classes, the code does not indicate.

Federated Truck Operators Await NRA Action on Code of Fair Competition

WASHINGTON, D. C.—NRA action on the code of fair competition covering all trucking operations, by horse as well as motor, whether private or for-hire, submitted by the Federated Truck Associations of America, is expected later this week. This code, which was formulated at a meeting held here on Aug. 10-12 at which 28 state associations were represented, is intended to enable truckers to get their "blue eagles" promptly without subscribing to the President's Reemployment Agreement, which, in the opinion of transport interests, would impose unduly burdensome conditions on trucking operations.

The code covers minimum wages and maximum hours, makes less than reasonably compensatory or discriminatory charges unfair competition and states that adjustments in existing contracts to take care of increased costs resulting from NRA participation, are equitable and fair. Private truck operators coming under codes of the industries to which they belong, are excepted from the hour and wage provisions provided the maximum hours are not more and the minimum wages not less in such individual codes, than provided in the general trucking code. Administration is by the Executive Committee of the Federated Truck Associations of America.

An organization meeting of the Federated Truck Associations has

(Turn to page 226, please)

What Will NRA Do to Automotive Costs?

by Athel F. Denham
Field Editor, Automotive Industries

AN increase in manufacturing costs approximating 5 to 10 per cent of list price seems to be indicated at this writing for the automotive industry taken as a whole, as the result of wage and salary increases and shorter hours under the NRA.

Assuming that this admittedly rough estimate is correct, an assumption without any very certain foundation, considering the paucity of statistical information available in the industry, it does not follow that final overall costs and therefore prices will be that much higher. Two factors which have not been included in the calculations are increases in costs of raw materials and production volume. One will tend to increase the margin of increase still further, but if improvement in retail sales continues, decreasing fixed charges per car produced might easily more than offset the entire increase in cost.

A third item not taken into consideration is the question of impending capital investments in machine tool equipment to modernize automotive plants. That machine tool buying will shortly show a marked upturn no major production executive in the industry will deny. Fears that the Recovery Administration in Washington would frown on purchases of new production equipment have been amply allayed in recent weeks by public statements of some of its executives.

Will automobile prices go up? That is a question to which no one as yet has the answer. On some cars prices undoubtedly will be higher and that before long. Increasing costs are stimulating some producers toward earlier introduction of new models than would otherwise have been the case—and higher prices certainly are to be anticipated on such lines. Whether or not such prices will hold after the automobile show season will depend largely on the competitive situation as it develops when all manufacturers are in the field with their 1934 models. By that time there should be available some clearer idea of what costs are going to be for the next 12 months, particularly on parts production and parts prices.

As this is written discussions are being held in Washington as to whether the NACC and APEM codes should contain something along the lines of Section 12 of the President's blanket code. This section provides for adjusting prices on standing contracts to meet any increases in cost of suppliers under the NRA. In principle it therefor acknowledges justification on the part of the buyer for higher prices due to higher wages and shorter hours in the supplier's plant.

There seems to be a good indication that a number of important car manufacturers will oppose the insertion of such a clause in their own code, and further indications are available that parts and equipment suppliers will oppose such a clause in their code unless they are given an opportunity of obtaining price adjustments from their own customers.

It goes without question that manufacturing payrolls are going to be affected more seriously in the case of the average parts and equipment manufacturer than in the case of the car manufacturer. Price chiseling during recent years has forced down wages in parts plants at a much more rapid rate than in the car factories.

Already parts suppliers who have increased their payrolls to meet with the requirements of the Blanket Code, have met with rebuffs on the part of their customers when they have requested upward price revision to meet costs. Threats of contract cancellation or of taking over production of such items by car factories are becoming more frequent, and have put parts plants on the "spot."

Another highly important factor relating to car costs is involved in the custom of some organizations of selling original equipment parts below cost in the anticipation of making up the losses on sales for replacement installation. Codes of fair competition specifically outlaw such a procedure. There is today no way of estimating the quantitative importance of the elimination of below-cost selling if it should come about.

Moreover while car factories have probably a clearer idea of production costs, past and present, in their own plants, than any other lines of business, they today have no idea of what the New Deal involves in the way of mechanical production set-up. Are double shifts more desirable than single shifts with more men and more equipment per shift? Offsetting the added machine tool equipment, tooling and maintenance required are the lowered charges for supervisory, light, heat, etc.

Parts plants have even less idea, and in this case there is little available even as to production costs in the past and at the present time.

In view of this tremendous uncertainty as regards the future both the car factories who signed the NACC code and the parts and equipment producers who are signatory to the APEM code are to be congratulated for their patriotic attitude in submitting a code. All of them amply realize that the New Deal and the Industrial Recovery Act seriously complicate the financial and production problems of the industry.

The original equipment parts industry today is probably doing more worrying than the car factories. Will the New Deal shuffle some of them out of business? This fear was indicated clearly at the organization meeting of the APEM but an attempt made at that time to insert in the APEM code a clause which would lay the car factories open to criticism if they took over further parts production was voted down. As C. S. Davis, president of the Borg Warner Corporation, put it, the New Deal with its "unfair competition" provisions merely made it necessary for original equipment suppliers to place themselves on a sounder merchandising basis instead of trying to sell entirely on a question of price.

As the situation stands at the time this is written, the following factors are assuming major proportions:

1. Likelihood that both car and parts factories will assume a moral obligation to permit price increases on the part of their suppliers to the extent justified by payroll increases under the NRA.

2. Impending expansion of capital outlay for new equipment for three purposes: (The first two tend to reduce operating expenses).

A. New equipment to go with new designs.

B. Replacement buying of machine tools now obsolete or in poor condition.

C. Duplicate equipment in conjunction with increased employment particularly if sales continue to show improvement over last year.

3. Earlier introduction of "new models" to permit at least temporary price increases by car plants.

4. More radical changes in new models introduced later this year to increase saleability—thereby offsetting potentially higher price possibilities.

5. Earlier shut-downs for model change-overs as the result of the above factors, and shut down running slightly longer than would otherwise have been the case.

6. Expanded merchandising activities on the part of both car factories and the parts and equipment industry.

Engine Method Favored for Testing Diesel Fuels

Joint S. A. E.-A. S. M. E. Committee Seeks Standard Test for Rating Fuels in Order of Merit as Regards Ignitability in a Diesel Engine

WORK done in efforts to standardize Diesel fuels in this country and the present status of such standardization here were outlined in a paper by Dr. P. H. Schweitzer of Pennsylvania State College, Dr. C. H. Dickinson of the Bureau of Standards, and M. J. Reed, secretary of the Diesel Engine Manufacturers Association, which was presented to the World Petroleum Congress, held in London July 19-25.

The paper stresses the need for further research work. It is known that highly cracked products give trouble and that the amount of trouble is increased as the speed of the engine is increased. The trend in Diesel engine design is toward higher speeds, and the trend in petroleum refining toward a more highly cracked product. The joint S.A.E.-A.S.M.E. Committee which is carrying on the work of Diesel fuel standardization is convinced that research can be of decided help in laying out its future course. The first step is to have means to determine the suitability of an oil for Diesel operation.

According to the present view, combustion knock in a fuel-injection engine is caused by the accumulation of fuel in the cylinder prior to ignition. Even under conditions that insure ignition, the fuel does not ignite instantaneously but only after a certain delay. The longer this delay, the more fuel accumulates in the cylinder, which then burns more or less simultaneously with an audible knock. If the delay is extreme the engine cannot be operated with the fuel. Fuels of paraffin base, consisting chiefly of saturated, straight-chain hydrocarbons, give the smoothest combustion in Diesel engines, while napthalenes and aromatics burn roughly. The important problem before the committee is the development of a satisfactory method of test which will rate fuels definitely in the order of merit as regards ignitability in a Diesel engine, and to standardize such test method and procedure.

Two general methods need to be considered, viz., (a) strictly laboratory methods using some type of crucible or bomb into which fuels are dropped, injected and ignited by the high temperature of the container, and (b) engine methods in which the fuel is ignited by compression with or without high surface temperatures.

Much work has already been done with a variety of devices and methods of both types, so that a rather accurate estimate can be made of the possibilities of each type. Bomb and crucible methods in their simpler forms, such as the Moore apparatus, are simple and convenient to use and are adapted to laboratory practice. They, however, involve an ignition time lag which is usually many times the permissible ignition lag in an engine. Unfortunately the relation between time lag and ignition temperature is not the same for all fuels; therefore, so-called ignition temperatures measured by these methods not only differ from those in service, but do not rate fuels in the same order.

Determination of the maximum and minimum ignition temperatures, which correspond to zero and infinite ignition lags, would be of decided theoretical interest, but the existence of neither of them has yet been definitely proved.

The most serious objection to engine test methods is that the results obtained have no theoretical significance, and their practical significance is limited to the type and size of engine with which the tests were performed. Although satisfactory correlation has been found between engine starting tests and spontaneous ignition temperatures as measured by such an apparatus as the Farnboro bomb, no engine test can furnish results that can be expressed in ordinary physical units. Doubts regarding the limited practical applicability of the results obtained by engine tests have been largely dispersed lately by investigations performed on a great number of engines of widely varying types. The results have shown that: (1) With few exceptions, for which the reasons are clear, all engines rate fuels in substantially the same order, and (2) that the results obtained in any engine are not unduly sensitive to the type of

spray, the amount of fuel, or the injection timing.

In view of these findings and the favorable experience of numerous investigators with engine test methods, the Committee decided to confine the research program to a study of engine test methods and correlating laboratory ratings with field engine performance.

No matter what testing method is adopted for measuring ignitability, it is essential to determine the manner in which the rating of the fuel shall be expressed. One way would be to use a measured factor or quantity to express the rating, such as maximum injection-advance angle, ignition lag in degrees, or lowest usable compression ratio.

Use of Reference Fuels

Another way that is used for knock-rating of gasoline and has been proposed for rating the ignitability of Diesel fuels is based on two standard fuels, one of the two having a high, the other a low ignitability. The test fuel is matched with a fuel consisting of the two standard fuels in such a proportion that its ignition quality (in the arbitrary scale of the test) is equal to that of the test fuels. The rating of the fuel is then expressed as the percentage concentration of the high rate standard fuel.

Of the two, the Committee recommends the adoption of the second method for expressing rating. First, because such a rating is probably less sensitive to engine factors than such ratings as "lowest usable compression ratio," or "ignition lag, deg. c.a." Second, because engineers are already used to the octane numbers of gasoline and it is advisable to follow that practice.

Boerlage and Broeze propose as primary standards mixtures of Cetene ($C_{16}H_{32}$) and ∝-Methylnapthalene ($C_{11}H_{10}$). If these can be obtained in the required quantities their use is recommended. In the meanwhile, other pure substances of suitable viscocity and ignition characteristics which may be available for this purpose should be considered.

The testing procedure is not determined alone by the proposed selection of the testing instrument. The "ignitability" as such cannot be measured by any engine test, only determined indirectly on the basis of the behavior of the fuel in the test engine in regard to such characteristics as combustion-knock, ignition lag and rate of pressure rise.

Aside from the *fuel*, there are a number of *engine factors* that have an effect on the fuel behavior in an engine, as: 1. Compression ratio; 2. Intake air pressure; 3. Intake air temperature; 4. Injection timing; 5. Combustion chamber wall temperature; 6. Spray characteristics; 7. Amount of carbon deposits on nozzle, piston and combustion chamber; 8. Combustion chamber design (size, shape, turbulence); 9. Engine speed; 10. Engine load; 11. Fuel temperature; 12. Dilution with exhaust gases, and perhaps others. For a standardized test procedure it has to be specified what factors to keep standard, what factors to change and what quantities to measure.

Preceding the actual fuel testing, a complete systematic procedure would consist of:

A. An experimental investigation as to how such ignition characteristics as combustion knock, ignition lag, and rate of pressure rise correlate with each other and with the proposed fuel rating (Cetene number) in various tentative test engines and various operating conditions. If a reasonably high correlation has been found it should be determined which ignition indices reproduce easily and conveniently.

B. A study of the effect of the various engine factors on the fuel rating. On the basis of these studies it should be determined:

(1) Which ignition indices are least sensitive to engine factors and most sensitive to fuel.

(2) Which is the most insensitive region of each engine factor and how does that agree with the region corresponding to average operating conditions.

(3) What values should be fixed as test standards on various engine factors and what tolerances should be allowed.

The above preliminary work, if carried out carefully, would take a great deal of time and cost a great deal of money. It is fortunate therefore that there are available the results of a number of dependable researches, which even if used critically will cut the necessary work considerably.

The work of recent investigators makes it clear that the proposed test methods should yield reproducible results and that the engine variables have but moderate effect on the rating. The results have to be checked and amplified in certain respects, preferably in such a way as not to hold up but rather to parallel the main work. In supplementing the work done, particularly the following items would require attention:

1. Effect of air turbulence on ignition lag and rating.

2. Effect of carbon deposits on ignition lag and rating.

3. Effect of actual fuel temperature in the nozzle on ignition lag and rating.

In using the engine as a testing instrument it cannot be expected to deliver uniform results unless its construction and operating conditions are uniform. Since the engine factors as enumerated above have a decided influence on the relevant ignition characteristics, this involves the fixing of standard values for those factors, the selected standards being necessarily more or less arbitrary. One of the objects of the proposed experimental research is to furnish data for an intelligent selection of the standard engine factors.

Suitable standards have to satisfy several requirements:—1. The standard values should not differ much from the most frequently encountered operating conditions; 2. They should be easy to reproduce in routine tests; 3. The standard value of a particular engine factor should lie in a less sensitive region so that slight deviations from the standard value shall not falsify the tests results appreciably. Under these considerations tentative standards have been proposed. The final selection of standard engine factors for the test engine is to be based on the results of the cooperative and independent researches.

Standard Test Engine

The development of a suitable testing apparatus should be the major result of the proposed experimental research.

Theoretically any engine is suitable for fuel testing. The important point, however, is its sensitivity. A set engine, which permits no change in either compression ratio or intake air temperature or intake air pressure, will only be sensitive as a testing instrument to fuels of a certain grade. To fuels of other grades it will be insensitive, and many fuels it will be altogether unable to handle.

For instance, with a small engine of a fixed 1:15 compression ratio, coal tar oils cannot be tested because they will fail to ignite, the ignition lag being more than an engine cycle. In a variable com-

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pression engine the compression ratio may be raised to, say, 1:19, enabling the engine to ignite the fuel at top center after a convenient ignition lag of, say, 16 deg. c.a. In the same fixed compression engine good paraffinic gas oil may give an ignition lag as short as 4 deg. c.a. In this region an error of 1 deg. in ignition lag causes a relative error of 25 per cent. But if the intake air pressure is reduced from 30 to, say, 10 in. mercury, then the delay angle will be increased to say, 12 deg., where the measurements can be made with sufficient accuracy.

A Diesel fuel test engine must have such adjustable features that enable it to test accurately fuels of a large range. The most effective adjustments are compression ratio, intake air temperature and intake air pressure. The test engine must have one or more of these factors, besides adjustable injection timing.

The Committee considers it of great *practical* advantage to have a Diesel fuel test engine that corresponds rather closely to the C.F.R. gasoline test engine.

The oil refiners will need both in their laboratories and they will probably be operated by the same personnel. The familiarity with one test engine would be of assistance in operating the other. Many parts would be interchangeable and the supply of the engines and spare parts would be greatly facilitated if the test engines were nearly identical. The Waukesha Company has already done some development work in this direction which resulted in certain modifications of the C.F.R. engine for fuel testing. The C.F.R. engine is a variable compression engine of rugged construction, directly coupled with an electric motor. With a suitable cylinder head and fuel injection device it is excellently suited for Diesel fuel testing. Future development should logically start from the C.F.R. engine as basis.

The development of the standard test engine will be influenced by the adopted testing technique. The engine may be either run on its own power or driven by an external motor. The former has been used generally for ignition quality tests, while Pope and Murdock tried the latter with considerable success. Their procedure was to drive the engine with an electric motor as an air compressor with no fuel admitted. When the motor attained steady running conditions, fuel was admitted for a short interval, and if firing occurred the compression ratio was lowered until a further lowering of the compression ratio suppressed firing. The critical compression ratio is supposed to correspond to the lowest usable compression ratio in a similar engine.

There is one distinct advantage in a motored engine, namely, that it does not carbonize up the combustion chamber and nozzle, which an engine running on its own power on the border line of misfiring is liable to do. A disadvantage is that the operating conditions in a motored engine may not duplicate those of the running engine with regard to wall temperature, fuel oil temperature and injection characteristics. The absence of the residual heat may necessitate the maintenance of unusually high wall temperatures and perhaps also the use of artificial heat for the intake air. The absence of the continuity of the injection may require special means to establish standard injection characteristics.

While the motored engine does not duplicate exactly the normal conditions of the running engine, it gives a close approximation to starting conditions when most severe ignition difficulties are encountered.

The Committee recommends experimenting with both types, running engine and motored engine, to explore their possibilities.

In selecting a standard testing technique the experimental research should duplicate as little as possible the work of previous investigations. A study of the previous work done in England, Holland and in this country will probably rule out a number of possibilities that may present themselves and would otherwise require laborious experimentation.

A point which requires careful consideration refers to the ignition index. Several of them have been used as criterions in fuel ignition testing, including combustion knock, maximum rate of pressure rise, ignition lag, and misfire. The conclusion of the Committee is that the ignition lag should be used as primary ignition index, because it is relatively simple to determine, it truly represents the ignition quality, and it is less sensitive to engine factors than other alternatives.

Measurement of Ignition Lag

The measurement of the ignition lag in an engine can probably be made simpler than it is at present by the development of special instruments. In using standard reference fuels, the test would consist of measuring the ignition lag of the test fuel and matching a reference fuel which gives equal ignition lag. With fuels of widely different range an adjustment of the engine will be necessary to get injection lags of proper magnitude that can be measured with the necessary accuracy. Through preliminary tests the engine may be so adjusted that the actual ignition lag measurements take place in the neighborhood of, say, 15 deg. c.a.

If methods have been developed for measuring ignition lags in the standard test engine, identical methods can probably be used for fuel testing in service engines. This has a double significance. In the first place, field tests will furnish desirable guidance for the standardization of the laboratory tests. If not based on adequate correla-

tions, the standardized laboratory test will be of little value. Secondly, after a satisfactory testing code has been established, any service engine can be used for fuel testing. This will be of great benefit to the users of Diesel engines, because it will enable them to test fuels themselves without special equipment. Although an engine without such effective adjustment as variable compression ratio, variable intake-air temperature and pressure, will only be able to handle and test a very limited range of fuels, still the standardized field test will be of service to the user for testing fuels he is specially interested in.

If it is desired to simplify routine tests to the utmost, the ignition-lag method may be replaced by the "adjustment method." The latter consists in gradually adjusting an engine factor until the fuel shows an easily recognizable ignition behavior, such as incipient knock, misfiring, a certain rate of pressure rise, or, preferably, a certain definite ignition lag. The adjustment method can best be used with a variable compression engine, which permits of a gradual raising or lowering of the compression ratio, until the test fuel begins to knock or miss, etc. Having the test engine calibrated with reference fuels, the critical compression ratio at once determines the rating.

In addition to that portion here reproduced, the paper contains a brief history of efforts to standardize Diesel fuels in the United States, a survey of prospective Diesel fuel markets, and three appendices, Appendix A being an outline in tabular form of methods used by various investigators to determine the relative ignitability of Diesel fuels; Appendix B, a discussion of the problem of standardization of engine factors for ignitability tests, and Appendix C, a discussion of the selection of a suitable ignition index.

Inlet-Port Arrangements of Six Cylinder Engines

A DISCUSSION of the relative merits of various inlet-port arrangements for six-cylinder engines was communicated to the Société des Ingenieurs de l'Automobile by M. Bourgeois. There are four possible arrangements, as follows:

a. Six individual ports.
b. Ports siamesed two and two.
c. Two pairs of end ports siamesed, two central ports individual.
d. End ports individual, two central pairs siamesed.

With arrangements a, c, and d the two central valves are reserved for the exhaust to form a hot spot. In all arrangements the two end valves are made exhaust valves, so that the inlet manifold will not be so long.

a. This arrangement may give satisfactory distribution, although there will be a tendency to favor cylinders 3 and 4 which are close-coupled to the carburetor. To overcome this, branches 2 and 3 on the one hand, and 4 and 5 on the other, may be combined outside the engine, which would give an arrangement similar to d.

With arrangements b, c, and d and the firing order 1-5-3-6-2-4 the mixture supplied to the inner cylinders of the siamesed pair has a tendency to be rich. For low-speed operation this can be remedied by appropriate design of the manifold. At higher speeds the distribution tends to become uniform.

b. The supply for cylinders 3 and 4 is taken from the center of the manifold and directly opposite the carburetor. These cylinders normally have a tendency to take a richer mixture than the end ones. If the central inlet is eliminated by expedients in the design of the manifold, it is still very difficult to obtain uniform distribution between the three groups at all speeds.

At low speeds this arrangement always gives bad distribution, which manifests itself in difficult starting, and in order to secure good distribution at normal temperature it is necessary to increase the heat supply, which results in a decrease in power.

c. Cylinders 3 and 4, the same as in arrangement a, connect very close up to the carburetor, which increases the difficulties of distribution. Moreover, with this arrangement there is observed an important decrease in the engine torque at between 900 and 1200 r.p.m.

d. The junctions of branches 2 and 3 on the one hand, and of 4 and 5 on the other, with the main header of the manifold, are farther apart than in arrangement c, which is advantageous from the standpoint of good distribution.

Moreover, the drop in the torque referred to under c is noticed with this arrangement also, but is much less pronounced. It is this last arrangement which gives the best results.

The exhaust flames can be examined only if the exhaust manifold is removed or modified. If any changes are made along this line the heating of the charge is modified, and the distribution of the charge will be modified in consequence.

Inspection of the color of the spark-plug insulators gives a very rough index which is hardly sufficient to solve the problem. A variation in the mixture proportion of 10 per cent above or below the optimum does not give any noticeable change in the color of the insulators.

For this reason it is necessary to note the drop in speed of rotation on the test bench, when ignition of the different cylinders is cut off in succession. That cylinder which, when its ignition is interrupted, causes a smaller drop in speed than any of the others, receives a faulty mixture which is either too rich or too lean. To determine which of the two it is, two further tests are made, one with the carburetor set for a richer mixture, the other for a leaner mixture. The results of these tests will show in what respect the mixture received by the cylinder in question is at fault.

Oil Facts

E. F. Houghton & Co. has just released a technical booklet, "What We Learned About Motor Oils—in 2,540,575 Bus Miles." It contains a detailed cost analysis which throws much light on how the quality of motor oil may affect oil and gasoline costs as well as engine maintenance. A copy is yours for the asking.

NEW DEVELOPMENTS
Automotive Parts, Accessories and Production Tools

Natco Six-Way Hole Driller

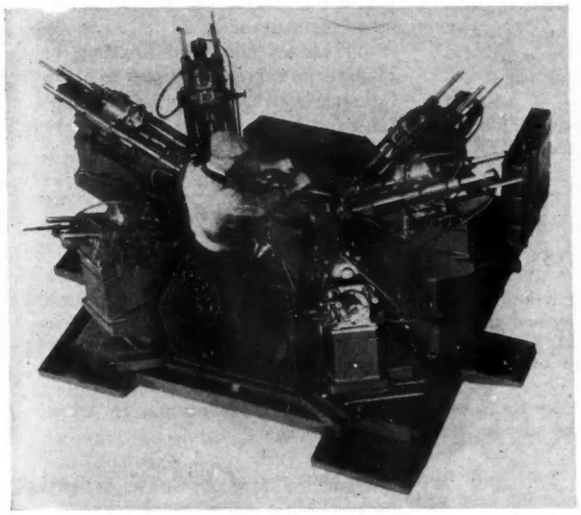
The National Automatic Tool Co., Richmond, Ind., has recently furnished a prominent automobile manufacturer a six-headed, special hydraulic feed driller arranged to drill the oil holes in a forged steel crankshaft. The machine is semi-automatic in operation, all heads being completely controlled by a single foot treadle.

Each unit is equipped with a single spindle arranged with nose adjustment. A special valve and trip mechanism permits automatic variation of drilling depths making possible the step drilling of the deep holes in the crankshaft. This feature permits the relieving of chips and the cooling of the drills during the drilling operations. In addition to longer drill life, a cleaner hole is obtained.

The fixture furnished with this machine is of the 4-position trunnion type and is arranged to hold one crankshaft in each position. The base is of welded construction and forms a reservoir for the hydraulic and coolant systems.

Weight—approximately 17,000 lb.

A production of approximately 25 crankshafts per hour is obtained.



The Natco Six-way hole driller is semi-automatic in operation, all heads being controlled by a single foot treadle

Heavy Duty I-R Compressor Announced

A single-stage, belt-driven compressor, Class ES, designed for heavy-duty service, has been placed on the market by Ingersoll-Rand Co., New York. It has one horizontal, double-acting cylinder and operates at moderate speeds. It is available in sizes from 10 to 125 hp., and for discharge pressures from 5 to 150 lb.

The machine is suitable wherever full-load, continuous service is required and wherever power cost is an important consideration. It is recommended for standby service for large compressors whose full capacity is not always needed. It is well adapted for use in isolated plants where there is little supervision, for all applications where oil in the discharge line is objectionable, or for installations where a future change in pressure conditions may call for a change in cylinder size. It will satisfactorily handle poisonous or inflammable gases, or any others that must be handled without leakage.

Improves Eye Protection

The latest advances in eye protection for oxy-acetylene welding and cutting are said to have been embodied in the new Oxweld No. 15 welding spectacles and a new lens, Type AA, just announced by The Linde Air Products Company, New York, N. Y.

The lenses are mounted in a natural canvas-bakelite frame and are 50 mm. in diameter. This exceptional width permits a wider angle of vision and gives greater protection against light and sparks.

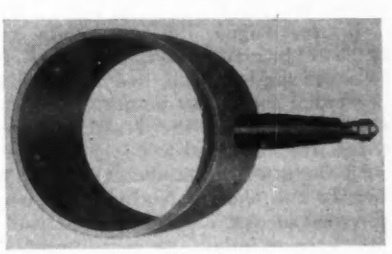
The temples (bows) are covered with insulating material, while the frame is non- flammable and does not conduct heat. By means of a snap device where the temples meet the frame it is possible to spread the frame and change in a few seconds. Oxweld Type AA, A, or B lenses can be furnished in the same colors and shades as for the Oxweld No. 12 goggles.

Adds New Aluminum Flux

An all-purpose aluminum welding flux, Oxweld Aluminum Flux, is announced by The Linde Air Products Company, New York, N. Y. This flux is intended to replace the two fluxes previously marketed, one for welding pure aluminum and the other for welding aluminum alloys.

New Tubes Veto Leaks

An interesting development in tube manufacturing that eliminates the customary air leakage of 2 to 5 lb. per week has been announced by The Firestone Tire & Rubber Co., Akron, Ohio. It is called the Sealtyte-Leakproof tubes, the name referring to two construction features which put an end to leakage. They are a tapered rubber valve stem that is cured into, and becomes an integral part of the tube, and a special compounded coating on the inside of the tube that seals the pores of the rubber. This tube is priced in the same range as ordinary heavy duty tubes, has outstanding advantages.



Firestone's Sealtyte Leakproof tube

Last Minute Changes Affect Open Shop and Basic Wage Clauses of NACC Code

Hours, Wages, Open Shop and Price Adjustments Expected to Be Among Points at Issue—N.A.C.C. Holds Preliminary Conferences with Administration

WASHINGTON, D. C., Aug. 17—Last minute revisions were announced today in the N.A.C.C. code on which hearings are scheduled to begin tomorrow.

The open shop declaration has been changed to read as follows: "Under the foregoing provisions, the employers in the industry may continue the open shop policy under which the selection, retention and advancement of employees will be on the basis of individual merit without regard to their affiliation or non-affiliation with any labor or other organization."

Originally, the open shop declaration read as follows: "In accordance with the foregoing provisions, the employers in the automobile industry propose to continue the open shop policy heretofore followed and under which unusually satisfactory and harmonious relations with employees have been maintained.

"The selection, retention and advancement of employees will be on the basis of individual merit without regard to their affiliation or non-affiliation with any labor or other organization."

Another modification would empower the N.A.C.C. to act as agency to gather data as to the observance and effectiveness of the code and to represent the industry in conferring with the Recovery Administration, but it is provided "The Chamber shall have no power to bind the industry or any subdivision thereof."

Hour and wage provisions are unchanged except that to the latter has been added a clause making rates applicable "regardless of whether the employee is compensated on the basis of time rate or of piece rate, or otherwise."

Hours, wages, the open shop and price adjustments in existing contracts to cover higher costs, are expected to be among the major points at issue in the hearings on the N.A.C.C. code, which are scheduled to begin tomorrow with Deputy Administrator Col. R. W. Lea in the chair. Nothing has been revealed as yet, as to Ford's attitude.

Organized labor, as represented by the American Federation of Labor, has been making determined efforts to unionize automotive plants and is expected to make its customary demand for the six-hour day, five-day week with a 70 cent hourly demands. These proposals are not taken seriously, however, but are simply regarded as bargaining strategy aimed at securing concessions on the 35 hr. maximum average week and the 40-43 cent minimum wage rates in the code.

While the N.A.C.C. code simply maintains the open-shop principle, the open-shop clause eliminated from the steel code insisted on the company union plan. The coal code declaration insists that each company will bargain collectively only with its own employees, and would not bargain collectively with other employers, or other employees or their representatives.

Among those participating in the conferences which the N.A.C.C. and NRA held this week were Alvan Macauley, president of the N.A.C.C., and its Industrial Recovery Committee, made up of the following: Donaldson Brown (Chairman), General Motors Corp.; Robert C. Graham, vice-president, Graham-Paige Motors Corp.; K. T. Keller, president, Dodge

(*Turn to page 226, please*)

NE

Durant Creditors to Get Cash Payment

DETROIT—All claims against the Durant Motor Co. of Michigan have been satisfactorily adjusted in federal court here. The final hearing on the receiver's report will be held in the federal court Sept. 6, and will be followed by a disbursement of cash to the creditors.

As We Go to Press

Dr. J. C. Hunsaker, vice-president of Goodyear Zeppelin Corp. and internationally distinguished in the field of aeronautical engineering, has been appointed head of the department of mechanical engineering at Massachusetts Institute of Technology.

* * *

A. F. of L. is reported to have organized two local unions in Flint, also one in Lansing and six in Detroit.

* * *

Checker Cab reports first half loss after charges of $151,857 against $360,081 loss in same period last year.

* * *

First half net profit after charges of $229,337 reported by Raybestos-Manhattan. Compares with loss of $117,600 in first six months of 1932.

* * *

Col. R. W. Lea, deputy administrator in charge of N.A.C.C. and A.P.E.M. codes, will also handle codes submitted by automotive wholesalers and by automobile dealers, it is reported authoritatively.

* * *

Reports that hearings on A.P.E.M. code would begin on Aug. 22 were said to be premature in Washington.

* * *

Rumors that N.A.C.C. and A.P.E.M. codes would be consolidated lack confirmation and are believed to be unfounded.

* * *

July was the biggest sales month in Diamond T history.

* * *

Hearings on gasoline pump manufacturers' code set for Aug. 24.

* * *

To cooperate more effectively with NRA, Asbestos Brake Lining Association has changed its name to Brake Lining Manufacturers' Association, and amended its by-laws. A special effort to induce all lining makers to join is in progress. Bradley Dewey of Multibestos has been elected president. W. J. Parker is general manager. New association will affiliate with Asbestos Institute and will subscribe to its basic code, but will draw up its own merchandising plan and code of ethics.

* * *

Railroad presidents asked to supply information on competition between railroads and trucks in handling LCL freight and on development of store-door service, by Joseph B. Eastman, Federal Coordinator of Transportation.

* * *

Rubber code bans sales below cost.

* * *

Sept. 2-9 will be Automotive Week at Century of Progress with special promotional features.

August Now Expected to Exceed 200,000 as Several Factories Increase Output

Expansion Due in Some Cases to Desire for Earlier Clean-up of Parts Commitments to Permit Advance in New Model Changeover Dates—August Sales Smaller

by Athel F. Denham
Field Editor, Automotive Industries

DETROIT — Production schedules for August have been stepped up in several car plants during the past week indicating a probability that August totals for the industry will once more exceed the 200,000 mark, an increase of more than 100 per cent over last August. While some of the increase is due to maintenance of sales at a high level, another factor involved is the desire of some manufacturers to expedite the cleanup of present parts commitments in anticipation of earlier shutdowns for new model changeovers than had been contemplated.

Retail domestic deliveries, which held up well the first week in August, showed a tendency to soften last week with indications that August totals, while showing further improvement compared with last year, would be somewhat below July for which month factory dealer delivery reports showed sales of approximately 190,000 cars, a decline of some 5 per cent under June totals. Fall sales campaigns now getting under way for several makes, including Pontiac, Dodge and Chevrolet may offset some of the decline later.

So far August retail domestic deliveries are ahead of the corresponding period in July due partially to the July 4 holiday.

Plymouth has stepped up production to 30,000 from an original schedule of 25,000.

Dodge reports retail deliveries of 2430 passenger cars and 685 trucks for week ending August 12, bringing August totals to 5283 cars and 1453 trucks as compared with 4375 cars and 1183 trucks for same period in July.

G. M. Domestic Dealer Stocks Down 5380, First Half Report Reveals

Earnings for First Six Months Were More Than Three Times Last Year—Working Capital Increased Over $34,000,000 Since End of 1932

NEW YORK—Despite a 27,998 increase in U. S. dealer stocks of new General Motors cars in the first six months of 1933, dealer inventories on June 30 were 5380 units lower than on the same date in 1932, it was revealed by President Alfred P. Sloan, Jr., in the corporation's semi-annual statement released this week. During the second quarter of this year, Mr. Sloan also stated, divisions of General Motors paid out 60 per cent more wages than in the same quarter last year. Wage payments in the first quarter this year were 20 per cent under a year ago.

Earnings of the corporation for the six months' period were, as reported in July 29 *Automotive Industries*, $48,068,176 after depreciation, Federal taxes, etc., against $15,019,404 in the corresponding 1932 period. The depreciation for the period charge was $14,961,284, as compared with $18,576,836, a saving of $3,615,552 resulting from the write-down of the plant account at the end of 1932.

Units sales in the first half were 498,622, as compared with 394,915 in the first half of 1932, an increase of 26 per cent. Dollar volume totaled $311,954,474 against $296,798,534, a gain of only 5 per cent. The smaller gain in dollar volume is a reflection of lower prices and also of the relatively very much better showing made by the lower-priced cars in the General Motors line.

Dividend payments on common and preferred during the six months' period amounted to $26,438,415 against $37,313,415, the difference being due to the fact that the common received 50 cents a share in the first quarter of 1932 and 25 cents in each quarter since that period.

The already impregnable financial position of the corporation was further strengthened in the first half as the following data from the balance sheet reveals:

	June 30, 1933	Dec. 31, 1932
Current assets ...	$331,272,833	$283,258,874
Current liabilities	71,773,002	57,821,680
Working capital .	259,499,831	225,437,194
Cash	158,376,190*	151,152,747
U. S. Securities ..	15,925,250	19,327,083
Other marketable securities	26,187,323	2,300,865
National Bank of Detroit—Capital Stock	9,693,975	.....
Inventory	70,671,624	75,478,612

* Not including cash balances in closed banks amounting to $13,837,443.

U. S. Can't Pay Higher NRA Costs

Controller McCarl Rules Law Prohibits Price Increases on Existing Government Contracts

WASHINGTON, Aug. 17. — The National Recovery Act notwithstanding, government contracts must be filled according to their original terms. Ruling to this effect was made yesterday by Controller General McCarl, who said there was no existing legal authority for such changes. The next Congress is expected to remedy the difficulty but meanwhile Uncle Sam's supplies apparently are without redress.

Under Section 12 of the President's Reemployment agreement readjusted contract prices are proposed where costs to sellers have been increased under a code. These cover private contracts and propose that purchasers compensate sellers who have been put to added cost by reason of the code agreement. The ruling of the Controller General places the government in the anomolous position of making a supplier stick to his price in face of higher costs forced upon by the government's code while the government is unable to do what it is asking private industry to do. However, the government is known to be providing for compensation now by allowing higher prices it pays for supplies but on past contracts this does not apply.

Hudson Has Another Week of Bigger Sales

For the twenty-first consecutive week, sales of Essex Terraplanes and Hudson cars have shown an increase, according to Chester G. Abbott, general sales manager, with the week ended Aug. 5. Registering a gain of 119 per cent over the same week in 1932, which was one of the high weeks of that year. For the four-week period ended Aug. 5, sales were more than double those for the same period in 1932.

Cole Opens Office

DETROIT—Roy E. Cole, chief engineer Rockne Motors, who is on an indefinite leave of absence to carry on some engineering development work, has opened an office at 2832 East Grand Blvd.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

Trend Still Up

General business last week continued upward, although there was a retarding element attending the adjustment to the new working provisions of the blanket code. Retail trade maintained recent gains. Employment and wages were still on the increase. Industrial activity held up quite well, as the usual seasonal recession was offset by the return of thousands of individuals to their jobs and by the higher wages in several quarters.

More Cars Loaded

Railway freight loadings during the week ended August 5 totaled 613,112 cars, which marks a decrease of 25,284 cars below those during the preceding week, an increase of 116,486 cars above those a year ago, and a decrease of 121,618 cars below those two years ago.

The Federal Reserve Board's preliminary adjusted index of department store sales for July stood at 69, as against 68 for June and 67 for May. The July sales were 4 per cent larger than those a year ago.

Power Output Rises

Production of electricity by the electric light and power industry of the United States during the week ended August 5 was 15.6 per cent above that a year ago.

New York State factory employment during the month ended July 15 increased 4.2 per cent, while total payrolls increased 6 per cent. These advances occurred despite the fact that July is normally one of the dullest months in the year.

Average daily crude oil production for the week ended August 5 amounted to 2,679,200 barrels, as compared with 2,697,850 barrels for the preceding week and 2,171,900 barrels for a year ago.

Prices Decline

Professor Fisher's index of wholesale commodity prices during the week ended August 12 stood at 70.3, as against 70.6 the week before and 69.6 two weeks before.

The stock market last week was relatively quiet, and speculative interest has not been revived since the collapse of the market during July. The volume of transactions was very small, falling well below a million shares on Monday. Net changes for the week were irregular; and, while there were some advances, none of them was sharp.

Reserve Ratio Steady

The consolidated statement of the Federal Reserve banks for the week ended August 9 showed a decrease of $8,000,000 in holdings of discounted bills and an increase of $10,000,000 in holdings of Government securities. Holdings of bills bought in the open market were practically unchanged. The reserve ratio on August 9 stood at 68.4 per cent, at which level it has remained since June 28.

Non-Stock Cars to Race in Elgin Free-For-All

CHICAGO—Non-stock entries will be accepted for the 305-mile free-for-all road race scheduled to be run at Elgin, Ill., on Aug. 26. Previously entries in this event had been limited to stock cars but a decision was reached this week to let down the bars on non-stock jobs meeting the requirements laid down by the Indianapolis Speedway for the Memorial Day 500-mile race. The winner of this race will receive in addition to a cash prize, $500 offered by the Elgin National Watch Co.

The free-for-all event will start at 2 p. m. and will be preceded in the morning by a 203-mile contest open only to stock cars of 231 or less cu. in. displacement. The winner of this event will receive outright a silver trophy offered by Joseph Weidenhoff and will have his name inscribed on the permanent trophy put up by the Elgin Watch Co. and which has been in competition since 1910. The last Elgin road race was won in 1920 by Ralph DePalma in a Ballott.

Cord Corp. Acquires Checker Cab Control

Company is Leader in Taxicab Manufacturing

CHICAGO—Cord Corp. this week acquired control of the Checker Cab Manufacturing Co., according to an announcement by L. B. Manning, executive vice-president. The Checker company is one of the largest producers in the taxi field. In 1932 it sustained a loss of $821,105 after depreciation, interest, etc., compared with net incomes of $431,168 in 1931 and $504,690 in 1930. Its December 31, 1932, balance sheet showed total assets of $4,546,779 of which $2,263,550 were current against current liabilities of $470,492, leaving a working capital of $1,793,058. The balance sheet shows a mortgage payable of $67,000 and notes payable of $325,000, the latter item being included in current liabilities. Sales in 1932 were $85,998 as contrasted with $4,416,067 and $7,688,928 in 1931 and 1930 respectively.

The acquisition of Checker follows closely after a deal announced on Aug. 3 as the result of which the Cord Corp. got control of the New York Shipbuilding Corp., one of the largest units in its field. The latter company incidentally has received Navy Department contracts totaling $38,434,000.

In addition to these companies, Cord Corp. interests include Auburn, Lycoming, Limousine Body, Stinson Aircraft, Columbia Axle, L. G. S. Devices and Spencer Heater. Mr. Cord and Mr. Manning also are respectively board chairman and president of the Aviation Corp.

Tire Output Higher and Inventories Lower

NEW YORK—Shipments of pneumatic casings for the month of June were 21.7 per cent over May but 37.4 per cent below June, 1932, when impending excise taxes skyrocketed sales. Production of pneumatic gained 17.5 per cent over May and 8.1 per cent above June, 1932. Pneumatic casings in the hands of manufacturers June 30 were 2.1 per cent under May 31 stocks but 32.3 per cent above stocks June 30, 1932.

The actual figures as compiled by the Rubber Mfrs. Assn. follow:

PNEUMATIC CASINGS

	Shipments	Production	Inventory
June, 1933..	6,305,454	6,099,924	6,614,940
May, 1933..	5,180,173	5,189,291	6,760,165
June, 1932..	10,064,915	5,643,329	4,999,075

Graham Ups Schedule

DETROIT—Graham-Paige Motors Corp. has increased its production schedules for August by 26 per cent over the volume originally scheduled, according to Robert C. Graham.

Jenkins Drives Pierce 3,000 Mi. at 118 M.P.H.

SALT LAKE CITY—World's speed record for distances of 200 to 3000 miles was broken here on Aug. 7 by Ab Jenkins in a Pierce-Arrow 12 on a circular course laid out on the salt beds near Salduro. The records were established under A.A.A. Contest Board Supervision. The top speed for one lap was 128.1 m.p.h., while the average for 3000 miles was 118 m.p.h. Jenkins drove without relief. The car was a special Pierce-Arrow roadster stripped of fenders, top and windshield, and with a special axle ratio. It had an optional high compression head and a highlift camshaft. The engine developed 207 hp.

A summary of results follows:

	Old Record	New Record
500 miles	119.40	124.04
1000 miles	116.36	123.01
2000 miles	112.87	117.04
12-Hr.	112.82	120.50
24-Hr.	113.50	117.80

G.M. Exports Pass '32

Export shipments of cars and trucks from General Motors plants in the United States and Canada during July were 196 per cent greater than in July last year. Despite a lag under 1932 in the early months of the year, the progress made since March has been so rapid that the cumulative excess over 1932 amounted to 59 per cent at the end of seven months.

J. R. Hamlin Handy's Asst. Sales Manager

DETROIT—The appointment of J. R. Hamlin as assistant sales manager is announced by President A. A. Bull of the Handy Governor Corporation.

McQuay-Norris Earnings

ST. LOUIS—For six months ending June 30, 1933, McQuay-Norris Mfg. Co. earned $211,690. This compares with $210,450 for the first half of 1932. These earnings are after all charges, including the usual allowance for depreciation, and after providing for federal and state income tax.

Passenger Car Production by Wholesale Price Classes

(U.S. and Canada)

Six Months 1933 and 1932 Compared.

	1933	1932	Per Cent Change	Per Cent of Total 1933	Per Cent of Total 1932
Under $500	713,331	457,025	+56.0	80.9	59.9
$501-$750	126,165	199,330	—36.7	14.3	26.0
$751-$1,000	19,263	63,407	—69.6	2.2	8.3
$1,001-$1,500	11,856	30,020	—60.5	1.3	3.9
$1,501-$2,000	5,751	6,208	—7.1	0.7	0.8
$2,001-$3,000	4,592	7,002	—34.3	0.5	0.9
$3,001 and over	1,069	1,798	—40.5	0.1	0.2
Total	882,027	764,790	+15.2	100.0	100.0

Truck Production by Capacities

(U. S. and Canada)

	1933	1932	Per Cent Change	Per Cent of Total 1933	Per Cent of Total 1932
Under 1½ tons	151,826	135,481	+12.0	93.0	92.5
2 to 3 tons	9,396	7,153	+31.0	5.8	4.9
3½ and over	1,384	2,949	—53.0	0.8	2.1
Ambulances, fire, buses, etc	607	744	—18.0	0.4	0.5
Total	163,213	146,327	+12.0	100.2	100.0

Nickeloid Co. Has New Metal

CHICAGO—A new metal, chrome nickel silver, has been placed on the market by the American Nickeloid Co. It is composed of chromium bonded to nickeled silver base. It is rustproof and easily workable.

Utah Asks for Western Meeting on Motor Laws

CHICAGO—The Utah Legislature has requested the American Legislators' Association to call a motor vehicle conference of eleven Western states to meet in Salt Lake City, following a similar meeting of seventeen Northeastern states which has been called by the Pennsylvania General Assembly at Harrisburg, Pa., October 20 and 21.

Pierce Up 102% in July

BUFFALO—Pierce-Arrow car shipments for July were 102 per cent above those for the corresponding month a year ago, according to Roy H. Faulkner, vice-president in charge of sales. Reports of July retail registrations from the ten states thus far recorded indicate that retail business continues to improve, there being a 63 per cent increase over July a year ago.

Yale & Towne Buys Two Automotive Plants

NEW YORK—Yale & Towne Manufacturing Co. has purchased the real estate, machinery, tools, inventory, patents and good will of the Walker Vehicle Co. and the Automatic Transportation Co. of Chicago. It will continue the manufacture and sale of the complete line of each company, retaining the present personnel with F. H. Tinsley in direct charge.

Wholesale Financing Up, Retail Financing Down, in First Half

Year and Month	Wholesale Financial Volume in Dollars	Retail Financing: Total — Number of Cars	Total — Volume and Average — Total Amount	Total — Volume and Average — Per Car	New Cars — Number of Cars	New Cars — Volume and Average — Total Amount	New Cars — Volume and Average — Per Car	Used Cars — Number of Cars	Used Cars — Volume and Average — Total Amount	Used Cars — Volume and Average — Per Car	Unclassified — Number of Cars	Unclassified — Volume and Average — Total Amount	Unclassified — Volume and Average — Per Car
June, 1932	$43,682,471	177,961	$63,169,095	$355	74,205	$38,329,334	$517	99,513	$23,394,676	$235	4,243	$1,445,085	$341
May, 1933	55,005,590	168,363	58,199,743	346	75,025	37,475,257	500	89,295	19,435,015	218	4,043	1,289,471	319
June, 1933	56,937,616	(a)185,286	65,514,154	354	84,358	43,004,313	510	96,741	21,181,515	219	4,187	1,328,326	317
First six months, 1932	218,434,137	885,070	318,626,272	360	324,140	177,742,363	548	535,165	132,414,741	247	25,765	8,469,168	329
First six months, 1933	238,139,219	766,878	263,084,265	343	321,441	163,340,505	508	427,045	93,973,865	219	18,392	5,769,895	314
Per cent change	+9	—13	—18	—5	—1	—8	—7	—20	—29	—11	...	...	...

Federated Truck Operators Await NRA Action on Code of Competition

(*Continued from page 215*)

been called to meet here on Aug. 22. Three delegates are requested from each state and it is asked that they represent respectively private carriers, contract carriers and common carriers. At this meeting, plans will be presented for permanent membership either by united state motor truck associations of all classes of operators or by state federations of truck owner organizations made up on any or all classes of owners. There will also be presented a plan for divisional organization along business or legal lines, each division to be controlled by its own officers. The cost to truck owners is expected to run 25 to 50 cents per year per truck.

The hours and wage provisions of the proposed general trucking code follow:

Section 2. On and after the effective date of the Code:

(1) The maximum hours for drivers and their helpers and dispatchers shall be forty-eight hours in any one week. Only productive hours shall be considered for loading and unloading. The hours spent by an owner or employee deadheading on a vehicle shall not be considered as working hours.

(2) In consideration of the difficulties attending the supervision of drivers and helpers while en route and of measuring actual performance, the employer may, at his option, determine that all or part of the work done may be measured in terms of scheduled miles on the following ratio of hours to miles: For a tractor, semi-trailer and one extra trailer, 720 miles of travel should be considered equivalent to forty-eight hours of labor; for a tractor and semi-trailer or for a truck and a trailer, 1000 miles of travel shall be equivalent to forty-eight hours of labor; for a straight truck 1200 miles of travel shall be equivalent to 48 hours of labor.

(3) In further consideration of the special conditions connected with this industry, the maximum hours of labor may exceed the maximum set forth herein for any one week; provided, however, that in such case the average number of hours per week for any six months' period shall not exceed the maximum of forty-eight hours per week.

(4) Except employees primarily or wholly in managerial, supervisory or executive capacities who now receive more than $55.00 per week, employees on maintenance and repair work, outside salesmen or solicitors, watchmen, billing and rate clerks, station managers or employees on very special cases where restriction of hours of highly skilled workers would unavoidably reduce service and except drivers and their helpers provided for under sub-sections (1), (2), and (3) of this Section 2, no office or other employee shall be caused or permitted to work for more than forty hours in any one week, and no subscriber to the Code shall reduce the hours in any establishment or service operation to below fifty-two hours in any one week, unless such hours were less than fifty-two hours per week before July 1, 1933, and in the latter case shall not reduce such hours at all.

Section 3. After the date of the employment of any member of the industry of any employee, such member shall not knowingly permit such employee, who shall have performed work for one or more other employers, to work for such member such number of hours, or their equivalent as provided in sub-section (2) of Section 2 of this Article IV as will result in a violation of the Code had all such work been performed for such member.

Section 4.

(1) The provisions of this Article IV regarding maximum hours may be adjusted to conform with maximum hours of different competitive forms of transportation agencies which are under the supervision of the Interstate Commerce Commission, Public Utility Commissions, and/or such governing regulatory bodies as may exist.

(2) The provisions in Article IV as to hours of labor and wage do not apply to private trucks that come under an individual code where both the maximum hours are not more and the minimum wage of that Code not less than provided herein.

Section 5. No member of the industry shall knowingly employ in or about its establishment or operations in the industry any person under sixteen years of age, except that persons between fourteen and sixteen years of age may be employed (but not in manufacturing or mechanical processes), for not to exceed three hours per day and those hours between 7 A. M. and 7 P. M. in such work as will not interfere with hours of day school.

Section 6. Until changed by amendment to the Code, no member of the industry shall pay to any of the classes of employees subject to the provisions of Section 2 of this Article IV less than forty cents per hour unless the hourly rate for the same class of work on July 15, 1929 was less than forty cents per hour in which latter case not to pay less than the hourly rate on July 15, 1929 and in no event less than thirty cents per hour in the North and twenty-five cents per hour in the South. It is agreed that this paragraph establishes a guaranteed minimum rate of pay regardless of whether the employee is compensated on the basis of a time rate or on a piece-work performance.

N.A.C.C. Ready for NRA Code Hearing

(*Continued from page 222*)

Bros. Co.; William S. Knudsen, president, Chevrolet Motor Co.; A. E. McKinstry, vice-president, International Harvester Corp.; Alfred Reeves, vice-president and general manager, N.A.C.C.; W. S. Elliott (Counsel), International Harvester Corp.; F. G. Donner, General Motors Corp.; Nicholas Kelley (Counsel), Chrysler Corp.; Gilbert M. Montague, counsel for the N.A.C.C. Industrial Recovery Committee; O. P. Pearson, N.A.C.C. of Commerce and Herman L. Weckler, Dodge Bros. Corp.

Mr. McKinstry has been selected as industrial adviser for the National Recovery Administration at the automobile code hearing. Charles Nash, chairman, Nash Motors, had been selected originally but was unable to serve owing to illness. President Green of the A. F. of L. and Prof. Sezler will serve as labor advisers. Dr. C. C. Balderston, Department of Industry, Wharton School of Finance, University of Pennsylvania, Philadelphia, will serve as the consumer adviser.

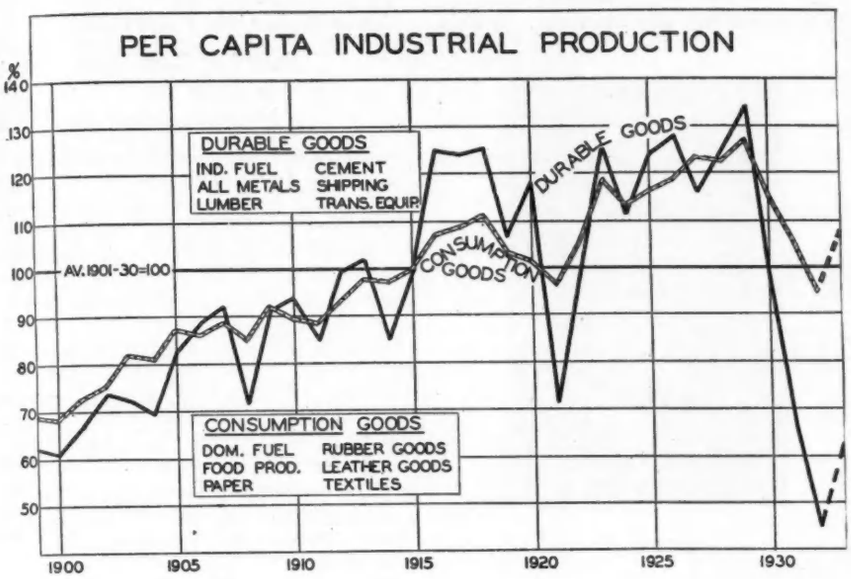
Expanding Volume Improves Industry's Earnings

	Net Income Six Months		Second Quarter	
	1933	1932	1933	1932
Auburn Automobile Co.	d$1,110	d$144	d$532	d$152
Chrysler Corporation	4,748	d880	7,786	1,186
Federal Motor Truck Co.	d183	d299	...	...
General Motors	48,068	15,019	41,198	5,323
Graham-Paige	24	d250	110	d416
Hudson Motor Car Co.	d1,326	d3,132	166	d1,886
Hupp Motor Car Co.	d781	d1,480	d258	d884
Nash Motors Co.	d280	534	d145	322
Packard Motor Car Co.	d1,110	d2,513	22	d949
Reo Motor Car Co.	d763	d1,340	d304	d587
White Motor Co.	d1,868	d1,428	...	...
Totals	$45,419	$11,466	$48,043	$1,960
Total less General Motors	d2,649	d3,553	2,845	d3,366
Goodyear Tire & Rubber Co.	$561	$51	...	...
U. S. Rubber Co.	d3,419	d5,028	...	...
Totals	d$2,858	d$4,977	...	...

D—Deficit.
000 omitted.

	Six Months		Second Quarter	
	1933	1932	1933	1932
Bendix Aviation	$549	d$52	$817	d$78
Bohn Aluminum & Brass Corp.	610	d74	509	d1
Borg-Warner Corp.	331	431	715	263
Budd Mfg. Co. (E.G.)	d491	d854	d94	d313
Budd Wheel Co.	d287	d643	16	d193
Campbell, Wyant & Cannon	19	d140	88	d117
Eaton Mfg. Co.	31	16	268	d43
Electric Auto-Lite Co.	316	1,099	245	551
Hayes Body Corp.	d198	d183	d100	d98
Houdaille Hershey Corp.	...	...	186	125
Kelsey-Hayes	d352	d1,030	22	d373
McQuay-Norris Mfg. Co.	212	210	...	...
Midland Steel Products	279	d275	342	d136
Motor Products	49	d124	196	55
Motor Wheel	115	d501	342	d273
Mullins Mfg. Corp.	d174	1	d48	d15
Murray Corp.	d447	d1,126	d32	d328
Stewart-Warner Corp.	d847	d1,024	d155	d487
Thompson Products	144	d13	219	d19
Timken Roller Bearing	653	418	929	200
Trico Products	539	601	368	171
Young Spring & Wire Co.	236	61	228	56
Totals	$1,287	d$3,202	$5,061	d$1,053

Revive Durable Goods to Restore Prosperity



THE diagram supplies strong support to the economic doctrine which holds that industrial depressions are largely caused by sudden decreases in the output of capital goods, and that business revival comes when demands for new construction and new equipment bring new stimulation to the creation of capital goods. During the 35 years covered by the diagram there have been five major depressions. Their low years were 1904, 1908, 1914, 1921 and 1932. In each case the output of capital goods fell to relatively low levels, but that of consumption goods declined seriously only in 1921 and 1932.

The most serious present problem suggested by the diagram is that of restoring the production of durable goods. The present campaign to spread work and to increase wage payments can have but little effect in financing the output of capital goods, and the three billion dollar program for public works can contribute only moderately. In 1929 when prices were high we produced consumption goods valued at about 30 billion dollars, and durable goods worth nearly 40 billions. To restore prosperity we must revive the production of durable goods, which involves the floating of corporate bonds, and that in turn requires the restoration of full faith in the future of money and credit.—*Cleveland Trust Co. Bulletin.*

Dealers Meet in St. Louis Code Session

ST. LOUIS — The National Automobile Dealer's Association code meeting opened here on Wednesday of this week with 83 leading automobile dealers from all over the United States in attendance.

The first business of the day was the election of officers of the Emergency National Committee as follows: F. W. A. Vesper, St. Louis, president of the association, chairman; A. G. Southworth, of New York City, vice-chairman; J. O. Munn, secretary.

Those present included delegates from 30 districts throughout the country, alternates, officers of the association and invited guests. The meeting is at Hotel Jefferson and will continue through Thursday.

A national code for automobile dealers, which will be signed and sent to Washington for the consideration of the National Recovery Administration, is being developed at the meeting. The code will provide machinery for controlling used car allowances but on the other hand, it is not expected to get into controversial questions of factory-dealer relationships.

Wahlberg Names Moore Nash Chief Engineer

KENOSHA, WIS.—N. E. Wahlberg, Nash vice-president in charge of engineering has appointed Mead F. Moore chief engineer.

Beginning with the inception of the company in 1917, the new chief engineer served as assistant to Vice-President Wahlberg. In 1922 he was placed in charge of the Milwaukee engineering department, and last year was made chief engineer of the important Racine engineering division. In his new capacity he will have general supervision under Mr. Wahlberg of all Nash engineering activities.

Automotive Buyers Press for Delivery

Some Weakness in Sheet Prices Reported but Steel Market Generally Is Firm

NEW YORK—Although the week's rate of steel mill operations is estimated to be a few points below that of last week, shipments into automotive consumption continue not only at an unusually good pace for mid-August, but in many instances specifications and shipping orders are accompanied by urgent requests for speedy deliveries. Some of the smaller finishing mills, eager to accommodate their customers, many of whom are asking for unreasonably quick service, are having a difficult time reconciling their daily production schedules with the restriction in weekly working hours under N.R.A. regulations.

From a statistical computation, worked out by the American Iron and Steel Institute, it is learned that, if maximum hours of work per man per week in the steel industry were limited to 40 hours, 85,400 men would be added to the payrolls, making the total 424,083, as compared with an average of 341,654 in the 1929-30 period. The total number of employees scheduled as available for and wanting work on or around July 1, 1933, was given as 338,683.

Flexible as the potential reservoir is upon which steel manufacturers can draw for common labor, the available supply of skilled and even semi-skilled steel mill workers is decidedly limited. Managerial skill of a high order is called for so as to adjust production to this supply amid limited working hours without impairing the industry's economic soundness and capacity to serve consumers under any and all circumstances.

It is expected that before Labor Day ends the year's usually dull business period, which this year was less so than in former years, all uncertainties regarding the steel market's cost set-up will have been eliminated. Meanwhile quoted prices are generally firmly adhered to, although there is talk of prices for automobile sheets not being quite so rigid as those for other descriptions.

Pig Iron—Automotive foundries continue to call for shipments of iron as needed, but in the aggregate good-sized tonnages are moving to this class of melters. The Connellsville coke market has resumed normal activities, following resumption of mining and charging of ovens, asked prices for foundry coke being $3.50@$4, representing advances of approximately $1 per ton over earlier-in-the-year prices.

Aluminum—Secondary smelters have instituted shorter hours and other cost-increasing factors tend to give the market for remelt metal a strong undertone. The lower value of the dollar in terms of the gold currencies of France and Switzerland is virtually shutting out fresh imports from those countries. The market for virgin metal is firm.

Copper—Pending Code action by the various branches of the industry, the market is largely marking time on an unchanged price basis.

Service Industries Show Opens Oct. 30

Provision Is Made for All Trade Sections to Attend

All elements of the billion-dollar automotive maintenance industry will unite in a representative trade exposition in the Merchandise Mart, Chicago, Oct. 30 to Nov. 4. The "Automotive Service Industries Show" will be presented under the combined auspices of the National Standard Parts Association, the Motor and Equipment Manufacturers Association and the Motor and Equipment Wholesalers Association.

A schedule of attendance has been worked out whereby the business building displays will be available to all sections of the trade. During the initial two days attendance will be restricted to members of the respective associations sponsoring the joint show and holding their conventions in Chicago simultaneously with the exposition. For Wednesday and Thursday invitations will be issued to wholesalers and distributors not identified with the association, to car factory service managers, to oil company executives and to representatives of other operators of chains of service stations. Beginning Thursday at 6 p. m. further restrictions will be removed and men in all departments of the automotive maintenance trade invited to view the latest developments in their business.

The personnel of the show committee follows: R. H. Bachman, Allentown, Pa.; F. C. Bahr, Minneapolis; N. H. Boynton, Cleveland; V. C. Hosselman, Lima, Ohio; L. F. Hunderup, Springfield, Mass.; Burke Patterson, Cleveland; D. W. Rodger, Detroit; M. T. Rogers, Cambridge, Mass.; Roy Schreiner, Harrisburg, Pa., and E. R. Seager, Cleveland. The show manager is A. B. Coffman, 35 East Wacker Drive, Chicago.

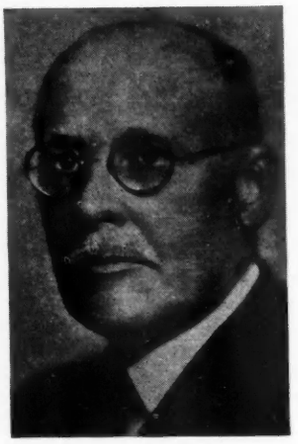
This committee is scheduled to meet in Chicago, Aug. 18, to visit the Mart and to lay plans for the most effective exhibition of the industry's products. Applications for space at the show were mailed last week.

J. Howard Muzzy

DETROIT — J. Howard Muzzy, chairman of the board of the Federal-Mogul Corp. and a prominent pioneer in the automotive industry, died of a heart attack early Wednesday, Aug. 9 at Nearbrook, his estate on Lasher Road in Bloomfield Hills.

Although retired from active business since 1926, Mr. Muzzy had been chairman of the board of Federal-Mogul since it was formed in 1924. Born in Romeo, Mich., 68 years ago, he came to Detroit in 1885 and soon afterward entered the mill supply business. In 1898 he and Edward Lyon formed the Muzzy-Lyon Co., Ltd. Mr. Lyon sold his interest to Mr. Muzzy in 1908.

In 1900 Mr. Muzzy began producing engine bearings and bushings. In 1924



J. Howard Muzzy

Mr. Muzzy's company, which had been operating under the trade name of "Mogul," merged with the Federal Bearing & Bushing Corp., and the corporate name was changed to Federal-Mogul Corp.

CALENDAR OF COMING EVENTS

SHOWS

Eastern States Exposition, Springfield, Mass. ..... Sept. 17-23
National Metal Exposition, Detroit ..... Oct. 2-6
Automotive Service Industries Show, M.E.M.A., N.S.P.A., M.E.W.A., Chicago ..... Oct. 30-Nov. 4
New York Automobile Show, Jan. 6-13, 1934
Chicago Automobile Show, Jan. 27-Feb. 3, 1934

CONVENTIONS

Nat. Assoc. of Motor Bus Operators, Chicago ..... Sept. 21-22
National Metal Congress, Detroit ..... Oct. 2-6

MEETINGS

S.A.E. International Automotive Engineering Congress, Chicago, Aug. 28-Sept. 4
American Chemical Society, Chicago, Sept. 11-15
American Transit Assoc., Chicago, Sept. 18-20
National Petroleum Assn., Annual, Atlantic City ..... Sept. 20-22
Natl. Safety Council, Chicago .... Oct. 2-6
National Metal Congress, Detroit. Oct. 2-6
American Petroleum Institute, Annual, Chicago ..... Oct. 24-26
Commercial Motor and Transport Vehicle Exhibition, London, England ..... Nov. 2-11
International Automobile Salon, Paris, France ..... Oct. 5-16
International Automobile and Motorboat Show, London, England, Oct. 12-21

Product Groups Must Write Cost Formulas

APEM Code Sets Oct. 1 as Date by Which Cost Methods Must Be O.K'd

DETROIT — Responsibility for adopting by Oct. 1, 1933, a definition of cost, a method of cost determination and a program of enforcement, is placed on each product group in the latest draft of the code of the Automotive Parts and Equipment Manufacturers, Inc. The new provision in the code takes the place of a previous one which provided a brief definition of cost, which definition was given in full in *Automotive Industries* of Aug. 5, page 172.

As the code stands now, this section reads as follows:

"It shall be unfair competition for any manufacturer engaged in the manufacture of Automotive Parts and/or Equipment to sell or exchange any product of his manufacture at a price or upon such terms or conditions as will result in the customer paying for the goods received less than the cost to the seller, except under such special conditions as may be agreed upon by the Product Group to which such manufacturer belongs.

"Each Product Group shall approve and adopt on or before Oct. 1, 1933, as a provision of its own Product Group Code to be effective not later than Nov. 1, 1933, a definition of cost, methods of costing and accounting and provisions for the administration and enforcement of the foregoing prohibition.

"Where a manufacturer produces more than one line of products, each line shall be considered a separate unit for purposes of ascertaining costs, and expenses of all kinds shall be properly and fairly allocated to the several lines, without violating the principles laid down in the Code to be adopted for the Product Group to which such manufacturer belongs."

AC Sales Hold Up Trend

FLINT, MICH.—AC sales in July increased 125 per cent in dollar volume over July a year ago and payroll increased 115 per cent. July sales, however, were 10.9 per cent under those of June this year, but ahead of last May. Some 700 workers were added in July and more than 1600 since April 1.

Giebel to Represent Sundstrand in New York

ROCKFORD, ILL.—It is announced by the Sundstrand Machine Tool Co. that R. Lewis Giebel has been appointed exclusive sales representative for that company's line of machine tools in the New York territory.